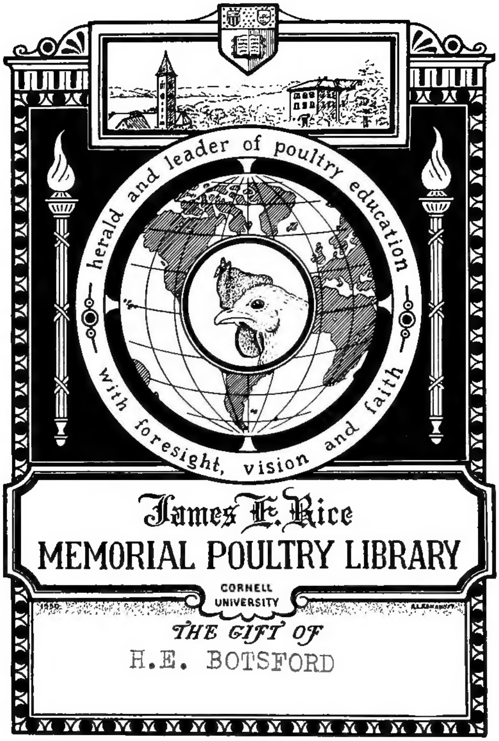
# PRACTICAL POULTRY HUSBANDRY

BY

T. E. QUISENBERRY

THE
AMERICAN POULTRY SCHOOL
KANSAS CITY, MO.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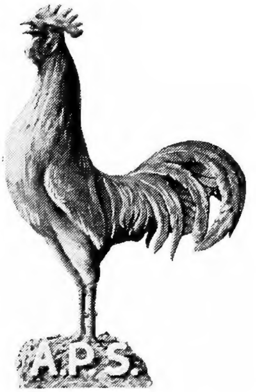

## VOLUME II

FEED AND FEEDING, THE BABY CHICK, INCUBATION, BROODING, INTENSIVE POULTRY CULTURE, FARM MANAGEMENT, ARTIFICIAL LIGHTING, BUILDING UP A TRADE.

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# Poultry Feeds and Feeding

By T. E. Quisenberry

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It may be laid down as a general rule that the most successful poultry raisers are those who are best acquainted with the science, and most adept in the art of feeding poultry. They understand the similarity in the composition of the various foodstuffs, and the birds to which the foods are to be given. They know the influence of the different foods upon the several organisms of the body, and they know how to apply this knowledge to the best advantage.

The nature and requirements of the feeds which we must give our poultry vary so greatly with the different ages and purposes for which they are being fed, that we cannot hope to achieve the highest degree of success unless we have a thorough understanding of the subject of feeds and feeding. Again, there are so many feeds and combinations of feeds which will answer the same purpose, but the prices of which vary so greatly, that it is necessary to know how to select and compound rations that will accomplish the desired end at the least cost.

These points are here mentioned briefly in order that the reader may grasp the importance of the subject, and especially appreciate the fact that in mastering it, he or she will be acquiring information which can be put into every day practice, and which will prove more and more valuable as time goes on. There can be no doubt but that those who have charge of the poultry on our farms and poultry plants might greatly increase their yearly profits by a better understanding of the principles of feeding, and a more careful application of them.

## THE SCIENCE OF FEEDING

**Similarity of Plants and Poultry.** Plants and chickens are similar in many ways. Both plants and chickens are alive. The plant cannot move about from place to place of its own accord. while the chicken can. Both plants and chickens breathe. The plant breathes through its leaves, while the chicken breathes through its lungs. Both plants and chickens must have food and water. The plant obtains its food and water from the soil and air. The chicken obtains most of its food by eating plants and the products of plants, such as the various seeds, grains, etc. So we see why the chemist has discovered that both plants and poultry are composed of the same elements; the difference being that these elements are combined differently in the plant than they are in the chicken.

The food given a fowl, and the resulting vitality, is the same as fuel to a steam engine. There are a great many types of engines, besides the high and low pressure ones, as there are a grat many types of hens and cock birds. As the diameter of cylinder, length of stroke, and revolutions per minute give you the capacity of the engine, so the length and depth of abdomen in the fowl gives its capacity. As the fuel fed into the fire box generates the steam to run the engine, so the food fed into the hen's digestive system generates her vitality.

Heat produces action, and as long as an animal lives its body has heat. We may say then that heat and action are the invariable accompaniments of animal life. Heat is the basis of action, for just as a steam engine is motionless and powerless without the heat of the furnace, so the animal body is motionless without heat. Just as the engine will stop unless we keep up the fire in the furnace, so the animal will die unless the fire of life is kept up with fuel foods. I say fuel foods, because of the fact that certain foods are oxidized, or burned in the body, to keep up heat. When we put wood, or coal, into the stove and touch a match to it, we say it burns; when we put foods into the animal stomach and they are consumed, we say they digest, but the chemical process is essentially the same, oxidation, and the effect is the same—heat. One need of the animal body, then, is heat producing foods. Heat is produced principally by two classes of foods known to chemists as carbohydrates and fats. These foods we will call, for convenience sake, 'fuel foods.'

"But heat is not the only need of the body. If the action of the steam engine wears out its steel parts, how much more must the action of the animal body wear out the much softer materials of which it is made. Every movement of the animal destroys many of the minute cells and delicate tissues of which the body is composed, and these must be replaced. To carry our figure of the steam engine still further, when the engine is worn by running, what do we do but have it repaired? The second need of the animal body that we discover, therefore, is repairs, or reconstructive materials.

"There is constantly going on in the living animal body a process commonly called waste and repair. The activities of life waste or tear down the body, and air, water and foods are the only sources from which material to rebuild it may be obtained. Foods, therefore, must supply the greater amount of the body-building materials."

## FAVORABLE CONDITIONS REQUIRED TO PRODUCE RESULTS

You must understand in the very beginning that no amount of feed will make some hens lay. They were not born and bred to lay. In a pen where both hens were fed alike, one laid 281 eggs and another laid 20 eggs.

No amount of feed will make a good hen lay, if she is not properly housed and sheltered.

The best of feed will not produce eggs and desirable results if the bird is eaten up with lice and mites, or internal parasites consume the food as fast as the fowl eats it.

No ration, no matter how good or how well balanced, will give good results if it is not intelligently and well fed. Feed wholesome food; feed liberally; feed a variety; feed regularly; feed actively, eggs, energy and health into your fowls.

## BREEDING, ENVIRONMENT AND FEEDING

Hens that are not properly housed and handled, and which are not comfortable and happy, of course, cannot be expected to produce their maximum number of eggs. Breeding, however, determines the possibilities of any hen. What causes five White Plymouth Rocks from one breeder, kept in one house, to lay 500 eggs in one year, when another pen of five White Plymouth Rocks from another breeder kept and fed and cared for in the same house to produce 1,000 eggs in twelve months? It is not the feed, the house, the water, the climate, or any other one thing which can be thought of, except the breeding, the blood lines and the power or ability of one to produce more than the other. For generations one may have been bred for eggs and the other evidently had not been so carefully selected and mated.

When placed under the microscope, it will be seen that every hen has from 2,000 to 6,000 ovules or small yolks in her body. This is more than any hen was ever known to produce in a life-time. The number of possible yolks and the number of eggs produced seem to bear no relation to each other. The problem seems to be to select and breed your birds that they will have the ability to develop these tiny yolks. You may give a hen all the feed she can eat, and if she is lacking in this ability, she will become overly fat or break down, but will not lay eggs. Breeding makes it possible for a hen, when rightly fed and rightly cared for, to produce a profitable number of eggs.

## SELECTION EQUALLY AS IMPORTANT AS FEEDING

Right feeding alone is not the key to increased egg production. More depends on careful selection of the hens. Too many farm flocks are non-producers and drones. Perhaps this is true of the entire flock or maybe only a part, but the drones are always responsible for the limited profits.

By selection, I do not mean that the farmer should buy prize chickens at exhorbitant prices, though I do believe in good blood, but selection is just as necessary in a flock of poultry as in a dairy herd.

Now, when you ask if the farmer can afford to keep chickens while grain is so high, if you refer to the usual flock of culls, I will say, "No." Grain is too valuable to be thrown promiscuously to non-producing hens.

It may be that you will think when I mention selection that I refer to a lot of scientific and complicated experiments. I simply mean that you should go into your flock, pick out the culls and get rid of them. A hen of low vitality is a menace to the flock because she is susceptible to disease. She is an expense to her owner because she is a consumer and not a producer. It is a funny thing, but many a farmer who would be quick to get rid of a poor cow will keep two or three dozen hens that never have made a cent for him and never will, no matter how he cares for them.

## HOW TO MAKE SELECTION

The rules that govern selection are as simple as A, B, C to any observing pêrson. For instance, a hen that is slow to feather is lacking in vitality. Anyone ought to know that. You can't stuff her and make her lay eggs. She is by Nature a weakling. Hens do not lay eggs because they want to; they lay eggs because they are strong and vigorous, and egg laying is a natural result which they cannot avoid. That tendency must be bred in them.

If the average farmer would give half the attention to his poultry that he does to his live stock he would find the poultry the better investment in many cases. Success comes from being willing to discard. When you have culled out the poor hens and got them clear off the farm, then it is time to begin thinking about feeding for egg production; and also, let me emphasize, watering for egg production, for water is as essential as feed.

At the present time, one of the greatest problems facing American Poultrymen is the ratio of profit between the cost of feed and the selling price of poultry and eggs. No poultryman can object to the high price of feed if the selling price of poultry and eggs is proportionately high. Thousands of the more or less inexperienced poultrymen, who were loaded with poor stock, drones and slackers, or who, because of inexperience, haphazard methods, or poor management, have been forced out of business. Many others in the same class are certain to go, but the future promises much for the man who has the goods and who knows how.

## GET RID OF THE DRONES

Before carrying your birds through another season, take one more look at them, and keep the following rules in mind when making your selection:

1. Market those which have been slow to feather or seem to lack vitality.
2. Keep the pullets which mature quickly and start laying first. Those which start laying when less than 200 days old will be the best layers if they have the right care.
3. Keep the late moulters.
4. Keep the birds with rather large, plump combs and wattles.
5. Hens with pale vents, pale beaks and pale legs have been good layers.
6. The skin of the best layers should be rather loose and flabby on the abdomen between the vent and breast bone.
7. The pelvic bones must be thin, straight, flexible and wide apart.
8. Market the hens which are baggy behind, and which have a heavy, fat, thick abdomen, which hangs down below the point of the breast bone.
9. Keep the hustlers and heavy eaters that go to bed late and with full crops.
10. Birds that have long toe nails, that show no signs of being workers are usually unprofitable.

11. If a bird meets the above requirements, it should have a broad back, long body, be stoutly built and in good flesh.

12. If a bird is not moulting and still has a small dried up comb, covered with a sort of whitish substance, or if a bird has thick or crooked pelvic bones, which will be found on each side of the vent and above the point of the breast bone, these are always money losers.

## INFLUENCE OF FEED ON THE BODY

The eight most important elements that we find in plants and poultry are: Carbon, Hydrogen, Oxygen, Nitrogen, Iron, Sulphur, Phosphorus and Calcium (commonly called lime). These elements are combined in various ways to make various kinds of food. For instance, our starchy foods are combinations of carbon and hydrogen. The scientific name for the starchy portion of the various foods is **carbohydrates,** which simply means that they are composed of carbon and hydrogen. When eaten by the chicken, these starchy foods are transformed into **fat, heat** and **energy**. The oil in foods is also composed of different combinations of hydrogen and carbon, the same elements that go to make starch. We find that when oil is eaten, it is used in the body for the same purposes as starch, but that it goes **two and one-fourth times as far.** So we might really say that oil is concentrated starch. Certain parts of nearly all plants and grains contain a large proportion of **nitrogen.** These combinations containing a large proportion of nitrogen we call **protein.** When protein is eaten by poultry it is transformed by the process of digestion into **lean meat and muscle.** Protein is also an important constituent of eggs.

Ash is that part of the body left after all of the combustible parts are driven off by heat. Iron, sulphur, phosphorus and calcium, found in oats, cotton seed meal, corn, wheat, in fact, all kinds of grains, beef scraps, ground bone and all animal feed, constitute the ash. The ash is used in the making of the shell and the contents of the egg. It is used especially for the making of the feathers of the growing chicks. The ash part of the feed is an important element.

The weight of ash in the hen's body ranges from 3 to 4 per cent. There is ash in vegetable feeds, but not sufficient to supply the needs of the growing chick or the laying hen. Wheat bran is rich in ash, which makes it a valuable feed for growing chicks or laying hens. Heavy laying hens require about 1½ pounds of ash per year to supply mineral elements for eggs. In addition, her body requires a large per cent of ash.

The best source of ash is ground bone which contains calcium carbonate and calcium phospate. Salt is a source of ash also.

Thus, briefly, we see the influence and effect of the various kinds of foods upon the body, and how the different elements are transformed into other combinations of the same elements in the body through process of digestion.

One of the factors which determine egg production is the feed ration, not merely the quantity of feed given, but the elements contained therein.

## CHEMICAL ANALYSIS OF FEEDS

In order that our students may know something about the chemical contents of various foodstuffs from a scientific point of view, and also as to their functions, I quote from Turner and Spears and the Association of Official Agricultural Chemists:

"Moisture in a feeding stuff is the water it contains, and it varies in amount from a few to as much as ninety per cent, depending on the kind, age or state of greenness, and whether stored in a dry or damp place. In grains and dried or cured fodder, hays, etc., it is estimated at from 8 to 15 per cent of the weight; in the grasses and other green foods, it may run as high as 85 per cent; while in roots, such as turnips, stock beets, carrots, etc., 90 per cent of the weight may be reached. Some feeding stuffs, such as distillers' dried grains and brewers' dried grains, have gone through a process of drying by artificial heat, thus greatly reducing their water content, and the amount they hold depends on the length of time they are allowed to remain in the dryer and the temperature of the same. When exposed to moist air, these artificially dried feeds will take up water again, the quantity absorbed depending upon atmospheric conditions and the extent of exposure.

"Protein is the nitrogenous constituent of a feeding stuff, containing about 16 per cent of the element nitrogen. The amount of crude protein in feeding stuffs varies from a few to about 50 per cent and even higher than this, the highly concentrated materials being meat scraps, blood meal, feeding tankage, cotton-seed meal, etc.

"Besides occurring in feeding stuffs, protein exists in nearly all natural foods, both animal and vegetable. Gluten of wheat, the albumen or white of eggs, the lean part of beef, the curd of milk and the fibrin of the blood are well-known forms of protein.

"**Crude fat** is the name given to that portion of a feed which is extracted with ether of similar solvents. The terms 'Ether Extract' or 'Fat' are often used, in reporting analysis, instead of crude fat. This constituent consists chiefly of fats and oils, but also contains other substances, as wax, resins and chlorophyll or coloring matter, which are soluble in ether. The percentage of crude fat in feeding stuffs varies from about 1 to 15 per cent.

'**Nitrogen-free** extract is a general term given to those bodies contained in a feed other than water, protein, fat, fiber and ash. In most feeding stuffs, the nitrogen-free extract consists chiefly of starch. Sugars, gums and pentosans (an insoluble carbohydrate of little importance) are usually present in smaller quantities which vary according to the kind of feed. In grains, the nitrogen-free extract runs from 50 to 75 per cent, and is almost wholly starch, while in the hulls and chaff of grain and roughages the amount is considerably less.

"**Crude fiber** is the woody part or structural material. It is composed largely of cellulose. It is insoluable in weak acid and alkali and is, therefore, but slightly digested. It is lowest in amount in hulled corn, which contains about 1 to 2 per cent, and highest in the husk of grains or hulls, such as cotton-seed hulls, which contain about 45 per cent, and in corn cob, which contains about 30 per cent.

**Ash** is the mineral constituent and consists principally of phosphate and carbonate of calcium and potassium.

"**Carbohydrates** are the nitrogen-free extract and fiber together, though the term is often wrongly used as synonymous with nitrogen-free extract."

## FUNCTIONS OF NUTRIENTS

Water, though essential to life, is not mentioned as one of the nutrients in a feeding stuff because its commercial value is practically nothing. The value of a feed is based upon the dry matter, or what is termed water-free content.

Protein is the most important, as well as the most costly nutrient in a feed, and the value of a feed depends very largely on the amount of this constituent contained in the feed. Protein supplies the nigrogenous material which is essential to the building up of the various tissues and secretions of the body. This constituent produces flesh, muscle, ligaments, glandular secretions, tissues, milk, blood, tendons, feathers, hair, hoofs, hide and is found in all portions of the animal's body containing protein and which have strength, including the bones which contain about 25 or 30 per cent. Under certain conditions, as in starvation, protein may serve as a source of heat and energy and it may be used to form fat, thereby taking the place of the nutrients, fat and carbohydrates. No other nutrient can be used to perform the proper office of protein, however, due to the fact that no others contain nitrogen.

Fat ranks next to protein in the valuation of the nutrients. It is used to produce heat and energy, and while carbohydrates are also used, fat is 2¼ times as valuable for the same purpose. Fat also serves as a protection to the protein compounds of the body against destruction and as a protection for the other tissues.

**Nitrogen-free extract** is also of importance as a source of heat and energy. While it does not have as great a power in this respect as fat, it is present in such large quantities in feeding stuffs that it serves an important part. The members of this group, however, differ in nutritive

### Relation of Nutrients in Feed to the Fowl and the Egg

| Feed | Fowl | Egg |
|---|---|---|
| Ash | Bone<br>Feathers<br>Blood | Shell<br>Yolk |
| Water | Water | Water |
| Proteins | Lean Meat<br>Blood<br>Nerves<br>Feathers<br>Energy<br>Fat | Albumen |
| Starches<br>Sugars<br>Gums<br>Fiber | Energy<br>Heat<br>Fat | Yolk |
| Fats<br>Oils<br>Waxes<br>Resins | Fat<br>Energy<br>Heat | Yolk |

value on account of the wide variance of their digestibility. The starches and sugars are readily soluble and almost completely digested, while pantosans and other less well-known substances are digested with much more difficulty and far less completeness. It is desirable, therefore, in selecting a feeding stuff that starches and sugars should constitute the principal part of the nitrogen-free extract, other things being equal. Nitrogen-free extract is converted into fats in the animal body and stored as such in the fatty tissues. Along with fats, it is consumed by the body, thereby giving out heat, muscular and intellectual energy. The amount of fats and carbohydrates assimilated over and above that used immediately by the body for heat and energy is the amount stored up as fat in the tissues.

Fiber, the woody portion or structural material of plants, is not so valuable a nutrient as nitrogen-free extract. Like pentosans, it is not very soluble and is one of the slightly digestible carbohydrates. It is contained in large proportions in material used as roughage and it is only for this purpose that it may be considered valuable. It is not well to use a too concentrated feed, and hence a feeding stuff containing a large per cent of protein and fat is fed with foods which contain a large per cent of crude fiber. When fed in this way, the animal derives a greater benefit from the nutrient.

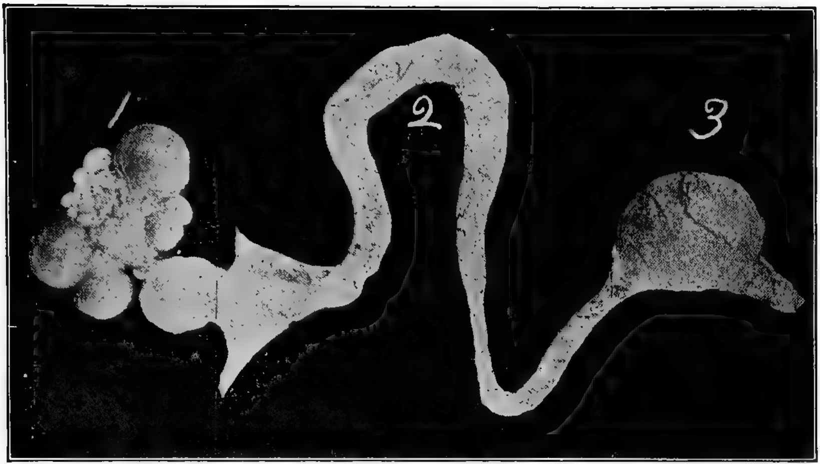
**Ash or mineral matter** found in feeds is the amount of inorganic material taken from the soil and stored by the plant during its period of growth. It forms the bony structure and is found in the various tissues and secretions of the animal body. Calcium, potassium, and phosphorus are the most important of these constituents.

## WHAT IS MEANT BY BALANCED RATION?

Many questions are asked as to what a balanced ration for egg production is, and how to balance a ration.

In order to determine more fully the effect of certain rations, we conducted a number of experiments. Each pen contained five hens.

The test with a narrow ration, containing elements which would produce three yolks for each white, laid 379 eggs in the first six months.



Photograph of the egg organs of a hen straightened out to show the sections where different parts of the egg are made.

The test where the ration contained elements necessary to produce two whites to each yolk produced 269 eggs.

The test with a ration containing equal yolk and white material, but without minerals to produce the shell, produced 161 eggs.

The test where the ration contained elements necessary to produce equally all parts of the egg, produced 603 eggs in the same time. This ration is called a **balanced ration** for egg production.

In order to explain more clearly what is meant by a balanced ration, the following illustration is given:

No. 1 is ovary where the yolk is produced.

No. 2 is the part of the oviduct where the white is made.

No. 3 is the part of the oviduct where the shell is made.

The yolk is composed principally of carbohydrates; the white, protein, and the shell, minerals. Thus, the three parts of the eggs are made largely from three kinds of food.

The following ration is fairly well balanced for egg production. Instead of using the terms carbohydrates and protein, the terms "yolks" and "whites" have been used. All fractions are omitted, therefore the table is only approximately correct:

GRAIN MIXTURE

| | | Yolks | Whites |
|---|---|---|---|
| Cracked corn | 150 lbs. | 390 | 188 |
| Wheat | 150 lbs. | 354 | 230 |
| MASH MIXTURE | | | |
| Wheat bran | 40 lbs. | 61 | 83 |
| Middlings | 40 lbs. | 83 | 85 |
| Corn meal | 40 lbs. | 102 | 45 |
| Ground oats | 40 lbs. | 80 | 64 |
| Beef scraps | 30 lbs. | 65 | 270 |
| O. P. oil meal | 10 lbs. | 16 | 50 |
| | 500 lbs | 1,151 | 1,015 |

The hens had access to oyster shell and grit, and were given two and one-half pounds of fine table salt and four pounds of fine charcoal in the above mash. In the above ration we feed two pounds of mash to each three pounds of grain.

"The composition of the egg never varies; at any rate nothing to speak of. The hen is an honest manufacturer, and she does not adulterate her product, even though she may be fed adulterated food. She puts the same kind of food into each and every egg. If she does not get the right kind of food she will not make the egg."

The basis for computing the above number of yolks and whites produced by each kind of feed was that one pound of carbohydrates would produce three and one-third yolks; one pound of protein would produce sixteen and two-thirds whites, this being the rate of the average hen.

It will be seen that from 150 pounds of corn, 390 yolks and 180 whites are produced, therefore it is not a balanced ration. The extra yolks are built into fat. In this way, hens fed on corn alone get extra fat, and we hear the old expression that "The hen is too fat to lay." The expression should be changed to read, "The hen can't lay is the reason she gets too fat."

If a hen has the ability to produce 24 eggs in one month when fed a balanced ration, but is fed an unbalanced ration, like corn alone, which produces two yolks for each white, instead of making 48 yolks in order to produce 24 eggs, she makes only the 24 yolks, but can complete only twelve eggs. The same thing is true of the whites. It is the same proposition of "no chain being stronger than its weakest link." No hen will lay more eggs than the weakest part of the feed ration.

In order to explain more clearly what is meant by balancing the feed ration, we will take an unbalanced ration and add other kinds of feed to make a balanced ration.

What is meant by a balanced ration for egg production is that the feed contains the proper elements necessary to produce all parts of the egg equally, and at the same time properly maintain the bodily needs of the hen.

Referring to the ration just given, suppose we feed corn alone, 150 pounds would produce 390 yolks and 180 whites. It will be seen that this is not balanced. Suppose we feed wheat alone, 150 pounds would produce 354 yolks and 230 whites. You will observe that wheat is a better balanced grain than corn.

Suppose we feed beef scraps alone, 30 pounds would produce 65 yolks and 270 whites. This is farther out of balance than either wheat or corn, but is out of balance by having more whites than yolks instead of more yolks than whites, as with corn and wheat.

The ration can be balanced by using:

| | | |
|---|---|---|
| 150 lbs. corn ---------- | 390 yolks | 188 whites |
| 20 lbs. beef scraps ---- | 43 yolks | 180 whites |
| | 433 yolks | 368 whites |

It will be noticed that 150 pounds of corn and 20 pounds of beef scraps make almost a balance, but it has been found that a variety of feeds in the ration gives best results.

Most tables show the per cent of carbohydrates and protein instead of the number of yolks and whites, and it is the relation of protein to the carbohydrates which is called nutritive ratio.

To illustrate: 100 pounds of corn contains 7.5 pounds protein and 78.2 pounds carbohydrates. There is 1 pound protein to each 10.4+ pounds carbohydrates, therefore, we say the nutritive ratio is 1 to 10.4+.

Suppose we want to get the nutritive ratio of a ration composed of a number of different kinds of feed. We should add all the protein together and all the carbohydrates together, then find the relation of the protein to carbohydrates which is the nutritive ratio. This can be done by dividing both by the amount of protein. It will, of course, go into the protein one time, and the relation will be one to the number of times it goes into the carbohydrates.

Fats and oils belong with the carbohydrates, but should be multiplied by 2¼ before being added to the carbohydrates, for they are two and one-quarter times as strong as other carbohydrates in producing fats.

**The Nutritive Ratio.** Practically all foods contain varying amounts of starch, oil and protein. For instance, 100 pounds of corn contains 7.5 pounds of protein, 67.8 pounds of starch, and 4.6 pounds of oil. 100

pounds of wheat contains 9.2 pounds of protein, 67.2 pounds of starch, and 1.6 pounds of oil.

The nutritive ratio of a food is the **proportion** between the starchy part of that food, including the oil, and the protein which it contains. As an illustration, let us figure the nutritive ratio of corn. Corn, as we have seen, contains 67.8 pounds of starch. It also contains 4.6 pounds of oil. But since a pound of oil has been found to go two and one-fourth times as far as a pound of starch in producing fat, or heat, or energy, in figuring the nutritive ratio we multiply the amount of oil by two and one-fourth. Two and one-fourth times 4.6 (the amount of oil), is 10.4. Adding 10.4 to 67.8 (the amount of starch), we have 78.2. Dividing 78.2 by 7.5 (the amount of protein), we get 10.4+. The nutritive ratio of corn, then, is 10.4+, which means 1 part of protein to 10.4 parts of carbohydrates. This is just another way of saying that there is 10.4 times as much fat, heat, and energy in corn as there is in lean meat. (This shows why it is that we feed lots of corn to hogs or chickens when we want to fatten them rapidly.) In the same way the nutritive ration of any other grain, or combination of grains, may be found, provided the relative proportions of starch, oil and protein are known.

**Feeding Standards and Balanced Rations.** We all know that the young growing chick would not do well on the same feed as an adult fowl. Again, we feed laying hens differently than we do poultry that we are fattening for market. Repeated, careful experiments have shown that growing chicks, for instance, do the best when given a ration, the nutritive ratio of which is about 1:4.5 to 1:6. (By the word "ration" is meant the **daily allowance of feed.** A ration may consist of a single kind of grain or any combination of grains, or foods of every description). Experiments have shown that laying hens do best on a ration, the nutritive ratio of which is 1:4.5 to 1:6, while the nutritive ratio of feed which gives best results for fattening fowls is about 1:7.5. The nutritive ratios of the rations upon which various classes of poultry have been found to give the most satisfactory results, we call **feeding standards.** The feeding standard for growing chicks, then, is approximately 1:4.5 to 6. The feding standard for laying hens is 1:4.5 to 6. The feeding standard for fattening fowls is about 1:7.5.

These standards must not be taken arbitrarily nor as absolute, for the same feeds vary in their chemical analysis, and different fowls vary in their ability to digest and assimilate. So the best test of any feed is the results obtained in actual feeding and practice.

Any ration which fulfills the requirements of the feeding standard for the particular class of poultry for which it is intended, is called a **balanced ration.** The aim of the successful poultryman is to at all times furnish a balanced ration. A ration is spoken of as a **"narrow ration"** when the amount of the combined starch and oil is not large in proportion to the protein. On the contrary, a ration is called a "wide ration" when the amount of starch and oil is large in proportion to the protein. A ration of 1:4 is a fairly narrow ration, while a ration of 1:8 is a wide ration.

Suppose, for example, that we want to prepare a balanced ration for fattening poultry. The feeding standard for fattening poultry is 1:7.5. We must prepare a ration, the nutritive ratio of which is about 1:7.5. Looking at our table, we find that the nutritive ratio of corn is 1:10.4+. Corn alone, then, will make too wide a ration. We must find some grain to mix with the corn which has a narrower nutritive ratio than our feeding standard. Buckwheat, with a nutritive ratio of 1:6.8, seems to fill this requirement. Suppose we try mixing equal parts of corn and buckwheat. Adding the nutritive ratios of corn and buckwheat and dividing by two gives 1:8.6. This is near enough to our feeding standard for all practical purposes. So we would be safe in saying that a ration of half corn and half buckwheat is a balanced ration for fattening poultry. Such a ration, however, might not fulfill all the requirements, as we shall see later.

## OTHER FACTS TO BE CONSIDERED

The mere fact that a ration is balanced as far as figures and ratios are concerned does not always mean that it is a good feed, or as good as some other feed that is not quite so well balanced, but, as a rule, the best balanced ration is the best food. By this, I mean that two kinds of food may contain the same amount of protein, but one may be digested and used by the fowl and the other may pass through undigested. As an example, you might mix one ration with a certain amount of protein in it, obtained largely by the use of beef scraps, clover and alfalfa, and you might have another ration containing the same amount of protein and having the same ratio, but obtained by the use of beans and cotton-seed meal. Both might appear the same on paper and have the same ratio of protein, carbohydrates and fat, but the first mentioned feed would produce the best results, because it contains feeds from which the fowls are able to consume, digest and assimilate the protein, while in the latter case much of it would not be used. So when we say that a laying ration should be composed of feeds that have a ratio of 1 to 4.5 or 6, it does no follow that it is always a good feed simply because it is so balanced.

The test of any feed is the result obtained in actual practice. It is important to know how to figure the ratios of feed mixtures. I would rather risk a feed that was balanced rather than one that was not, and, if I found it was not giving satisfaction, I would change the proportions to fit my ideas, or make such substitutions as I thought might improve my feed. I make the above statements for the reason that I sometimes recommend feed combinations to students. They figure the nutritive ratio and sometimes write back and state that the feed is not balanced so as to have a ratio of 1:5. This might be true and yet give them better results than any other combination of feeds that were obtainable in their particular section. So when a feeding standard or ratio is recommended don't get the idea that nothing else will do and that your feed is no good unless it meets this standard.

All other things being equal, I like to have my feed as near the standard as possible, but the digestibility of the food plays an important part.

**Some Other Factors.**—While it is important to feed a balanced ration, yet we must not fall into the error of thinking that the mere balancing of the ration is all that is required. Several other very important factors enter into the selection of a ration for any particular purpose. Perhaps the most important of these is **adaptability.** A ration must be especially adapted for the particular purpose for which it is intended. For instance, we would not think of feeding whole corn to newly hatched chicks, nor corn fodder to laying hens. **Palatability** is another factor that must be taken into consideration. Chickens seem to relish some grains and some ration better than they do others, although all may be balanced rations so far as the chemist is concerned.

Still another very important factor is **digestibility.** Poultry have no teeth. This fact has to be constantly borne in mind in preparing rations for them. Again, some feeds are naturally much more easily digested than others. It is possible for us to prepare various feeds so as to render them much more digestible than they are in their natural state. In this connection, we shall see later on that we can prepare a much more digestible balanced ration for fattening poultry than whole corn and wheat.

We cannot do our feeding entirely by rule. The mere fact that a ration is balanced will not bring the desired results within itself. We must see that it is properly fed; and that it is economical as well. We must make a careful study of the various kinds of feeds, and so mix them that the rations will not only be balanced, but make them, also, the best adapted for the particular purpose in view, and as palatable and digestible as possible.

**The Essentials of a Good Ration.** We see, then, that regardless of whether a ration is intended for growing chicks or laying hens, or fattening fowls, there are certain tests which it must pass, if it is to prove a satisfactory ration for the purpose intended. These tests or requirements may be briefly summed up as follows:

1. The ration should be composed of foods every one of which the fowls like.

2. The ration should contain a **sufficient quantity of digestible** nutrients to fill the requirements of the birds for rapid growth, or heavy egg production, or the quick laying on of fat.

3. The ration should have **enough bulk** to enable the digestive juices to penetrate the mass of food easily and act quickly.

4. The ration should contain **both whole grain and soft ground food.** Whole grain is necessary to provide for muscular activity for the digestive organs. Soft ground food is required to furnish quickly available nutriments needed for rapid growth or heavy continuous egg yield. Roughly speaking, the birds should consume about one-half of each.

5. The ration must include a **variety of feeds—grains, green** food meat food and mineral matter.

6. The foods composing the ration should **not have an undesirable effect** upon the color or flavor of the product. For instance, onions, barnyard manure, etc., give an unpleasant flavor to eggs. Also, the yolks of eggs laid by hens allowed to drink from barnyard pools have an undesirable reddish color.

7. The ration must have the **proper proportion** of protein and carbohydrates to supply the needs of the particular class of birds for which the ration is intended.

## EXAMPLE OF FINDING NUTRITIVE RATIO AND BALANCED FEED

If you should wish to find the nutritive ratio of a combination of feeds for a mash, we would proceed as follows:

| | Protein | Carbohydrates | Fats |
|---|---|---|---|
| 150 lbs. of bran | 18.7 | 62.4 | 4.5 |
| " " " corn meal | 10.4 | 103.5 | 5.3 |
| 50 lbs. of beef scraps | 27 | 1.3 | 5.9 |
| | 56.1 | 167.2 | 15.7 |

In one hundred pounds of bran there are 12.5 pounds of protein, 41.6 pounds of carboyhdrates and 3.0 pounds of fats, then in 150 pounds of bran there would be 1½ times as much as in 100 pounds. The same is true of the 150 pounds of corn meal. Multiply the amount found in 100 pounds of corn meal by 1½ and this gives you the amount found in 150 pounds. But with the beef scraps, if only 50 lbs are used you would have to take only half the amount of protein, carbohydrates and fat found in 100 pounds of beef scraps, which gives the above amount. The sum of the protein, carbohydrates and fat in the total amount of each food is found. We then proceed as follows:

15.7 total lbs. of fat
2¼
31.4
3.9
35.3 lbs. when reduced to equal carbohydrates
167.2 lbs. carbohydrates
56.1 202.5 total lbs. of carbohydrates (3.6+)
lbs. of protein 168.3
34.20
33.66
.54

The nutritive ratio of the above combination is 1:3.6+, which means that for every pound of protein there is 3.6 pounds of carbohydrates.

This was found by adding the amounts of fats in all the feed, 15.7

pounds, and then multiplying the sum of fat by 2¼ to reduce it to the equal of carbohydrates, 167.2 pounds, which gave 202.5 lbs. Then for each pound of protein contained in this combination there would be as many pounds of carbohydrates as 56.1 lbs. was contained times into 202.5, which gives 3.6+.

This means it is a narrow ration, being rich in protein. If you wanted more protein and wanted it still narrower, then add more beef scraps, or some other food rich in protein. If you wanted to balance the ration and make it nearer the standard, you could do it by feeding largely on corn as a grain feed, for corn contains more carbohydrates. Or you could add more corn meal to the mash, or some other feed rich in carbohydrates and fat. But the usual method is to have a mash rich in protein and balance the food by feeding equal pounds of scratch grain, which would make a balanced ration of about 1:5 to 1:6 for layers and growing stock. You can take any combination of feeds and figure them this way and change the combination until they meet your idea of a balance or fit the purpose for which they are intended.

### DIGESTIBLE CONTENTS OF VARIOUS POULTRY FEEDS

| Grains Food Stuffs | Per Cent Protein | Per Cent Carbohydrates | Per Cent Fats | Nutritive Ratio |
|---|---|---|---|---|
| Barley | 9.0 | 66.8 | 1.6 | 1:7.8 |
| Emmer | 11.9 | 62.3 | 2.2 | 1:5.7 |
| Buckwheat | 8.1 | 49.7 | 2.5 | 1:6.8 |
| Broom Corn | 8.4 | 63.7 | 2.4 | 1:8.3 |
| Indian Corn | 7.5 | 67.8 | 4.6 | 1:10.4 |
| Kaffir Corn | 9.0 | 65.8 | 2.3 | 1:7.9 |
| Milo Maize | 8.7 | 66.2 | 2.2 | 1:8.2 |
| Flaxseed | 20.6 | 17.0 | 29.0 | 1:4.0 |
| Cottonseed | 13.3 | 29.6 | 16.5 | 1:5.0 |
| Millet Seed | 8.6 | 60.6 | 3.0 | 1:7.8 |
| Sorghum Seed | 7.5 | 66.2 | 2.6 | 1:9.6 |
| Sunflower Seed | 13.5 | 38.1 | 20.3 | 1:6.2 |
| Oats | 9.7 | 52.1 | 3.8 | 1:6.3 |
| Cow Peas | 19.4 | 54.5 | 1.1 | 1:2.9 |
| Rice | 4.6 | 72.8 | 0.4 | 1:16.0 |
| Rye | 9.9 | 68.4 | 1.2 | 1:7.2 |
| Soy Bean | 30.7 | 22.8 | 14.4 | 1:1.8 |
| Velvet Bean | 18.1 | 50.8 | 5.3 | 1:3.5 |
| Field Pea | 19.0 | 55.8 | 0.6 | 1:3.0 |
| Peanut Kernel | 24.1 | 14.9 | 40.4 | 1:4.4 |
| Winter Wheat | 8.7 | 67.8 | 1.4 | 1:8.2 |
| Spring Wheat | 9.2 | 67.2 | 1.6 | 1:7.7 |
| Alfalfa Meal | 10.2 | 38.7 | 0.8 | 1:4.0 |
| Corn Meal | 6.9 | 69.0 | 3.5 | 1:11.1 |
| Coca or Cocanut Meal (low fat) | 18.8 | 42.0 | 8.1 | 1:3.2 |
| Coca or Cocanut Meal (high fat) | 18.4 | 37.6 | 17.1 | 1:4.1 |
| Gluten Meal (high grade) | 30.2 | 43.9 | 4.4 | 1:1.8 |
| Gluten Meal (low grade) | 23.2 | 44.1 | 9.7 | 1:2.8 |
| Linseed Oil Meal (old process) | 30.2 | 32.6 | 6.7 | 1:1.6 |
| Linseed Oil Meal (new process) | 31.7 | 37.9 | 2.8 | 1:1.4 |
| Cotton Seed Meal | 37.0 | 21.8 | 8.6 | 1:1.1 |
| Oat Meal | 12.8 | 56.9 | 6.0 | 1:5.5 |
| Rice Meal | 7.3 | 48.1 | 10.6 | 1:9.8 |
| Soy Bean Meal (fat extracted) | 38.1 | 33.9 | 5.0 | 1:1.2 |
| Fish Meal (high fat) | 37.8 | .... | 11.6 | 1:0.7 |
| Fish Meal (low fat) | 40.9 | .... | 2.2 | 1:0.1 |
| Fresh Bone | 18.3 | .... | 24.5 | 1:3.0 |
| Bone Meal | 22.6 | .... | 3.0 | 1:0.3 |
| Beef Scraps | 54.0 | 2.6 | 11.8 | 1:0.5 |
| Meat Meal | 58.7 | .... | 12.6 | 1:0.5 |
| Wheat Bran | 12.5 | 41.6 | 3.0 | 1:3.9 |
| Wheat Screenings | 9.6 | 47.3 | 3.6 | 1:5.8 |
| Wheat Shorts | 13.4 | 46.2 | 4.3 | 1:4.2 |

| Grains<br>Food Stuffs | Per Cent Protein | Per Cent Carbo-hydrates | Per Cent Fats | Nutritive Ratio |
|---|---|---|---|---|
| Wheat Middlings | 15.7 | 52.8 | 4.3 | 1:4.0 |
| Red Dog (low grade flour) | 14.8 | 56.5 | 3.5 | 1:4.4 |
| Dried Blood | 69.1 | .... | 0.9 | 1:0.03 |
| Steel Cut Oats | 10.6 | 51.7 | 6.5 | 1:6.2 |
| Oat Flour | 13.0 | 54.9 | 6.3 | 1:5.3 |
| Buttermilk (fresh) | 3.4 | 4.9 | 0.1 | 1:1.5 |
| Skim Milk | 3.6 | 5.1 | 0.2 | 1:5.0 |
| Whole Milk | 3.3 | 4.9 | 4.3 | 1:4.4 |
| Dried Milk | 51.2 | 15.9 | 1.2 | 1:0.4 |

There is great variation in the analysis of feeds as made by different chemists. That is, wheat of one variety may differ from wheat of another variety in the amount of protein, carbohydrates and fat that it contains. Even the same variety of wheat will vary if raised in different climates, different seasons, and different soil conditions. The same thing is true of all other grains and feeds. There are different conditions surrounding all feed stuffs, hence the variations in analysis of different chemists. The table which we give is just about an average and if other tables differ, do not let that confuse you. A slight variation will make no material difference in the results.

## YOLKS AND WHITES IN VARIOUS FEEDS

After comparing the amount of feed consumed to the number of eggs laid by different varieties of poultry in various egg laying contests, and, also, in making like comparisons in various feed tests we are led to the belief that where the average hen is fed all she will eat she will maintain her body and manufacture 3 1-3 yolks out of each pound of carbohydrates contained in the food which she consumes, and will make 16 2-3 whites from each pound of protein.

If she is well fed and cared for, judging from the records made, it seems reasonable to assume that this is true.

If you are feeding your hens a mixture that produces 100 yolks for every 50 whites, then it is possible for the hen to lay only 50 normal eggs. You will find it possible to take the following table and balance your ration so that your feed will contain practically an equal number of yolks and whites. The following table shows the number of yolks and whites produced by the average hen from one hundred pounds of the different kinds of feed:

## YOLKS AND WHITES IN VARIOUS POULTRY FOODS

| Food Stuffs | Yolks | Whites |
|---|---|---|
| Barley | 235 | 150 |
| Emmer | 224 | 98 |
| Buckwheat | 184 | 135 |
| Broom Corn | 230 | 140 |
| Indian Corn | 260 | 125 |
| Kaffir Corn | 236 | 150 |
| Milo Maize | 237 | 145 |
| Flax Seed | 273 | 343 |
| Cotton Seed | 222 | 211 |
| Millet Seed | 225 | 133 |
| Sorghum Seed | 240 | 125 |
| Sunflower Seed | 279 | 225 |
| Oats | 202 | 162 |
| Cow Peas | 190 | 323 |
| Rice | 246 | 77 |
| Rye | 240 | 165 |
| Soy Beans | 184 | 517 |
| Velvet Beans | 209 | 302 |
| Field Peas | 191 | 317 |
| Peanut Kernel | 353 | 402 |
| Winter Wheat | 237 | 145 |
| Spring Wheat | 236 | 153 |
| Beef Scraps | 217 | 900 |
| Meat Meal | 94 | 978 |
| Wheat Bran | 152 | 208 |
| Wheat Screenings | 185 | 160 |
| Wheat Shorts | 186 | 223 |
| Wheat Middlings | 208 | 262 |
| Red Dog (low grade flour) | 215 | 247 |
| Dried Blood | 5 | 1152 |
| Steel Cut Oats | 221 | 177 |
| Oat Flour | 230 | 216 |
| Buttemilk (fresh) | 17 | 57 |
| Skim Milk | 19 | 60 |
| Whole Milk | 49 | 55 |
| Dried Milk | 62 | 853 |
| Fresh Cut Bone | 196 | 336 |
| Blood Meal | 230 | 430 |
| Green Foods (forage)— | | |
| | Yolks | Whites |
| Alfalfa | 46 | 67 |
| Clover | 54 | 48 |
| Corn Fodder, green | .42 | 16 |

| | | |
|---|---|---|
| Alfalfa Meal | 135 | 170 |
| Corn Meal | 256 | 113 |
| Coca or Cocanut Meal (low fat) | 201 | 313 |
| Coca or Cocanut Meal (high fat) | 263 | 326 |
| Gluten Meal (high grade) | 183 | 503 |
| Gluten Meal (low grade) | 220 | 386 |
| Linseed Oil Meal (old process) | 159 | 503 |
| Linseed Oil Meal (new process) | 157 | 528 |
| Cotton Seed Meal | 137 | 616 |
| Oat Meal | 232 | 203 |
| Rice Meal | 240 | 121 |
| Soy Bean Meal (fat extraced) | 153 | 635 |
| Fish Meal (high fat) | 87 | 630 |
| Fish Meal (low fat) | 16 | 671 |
| Fresh Bone | 184 | 300 |
| Bone Meal | 23 | 377 |

| | | |
|---|---|---|
| Cabbage | 40 | 11 |
| Rape | 56 | 11 |
| Corn Silage | 42 | 15 |
| Blue Grass, lawn clippings | 40 | 88 |
| Kale | 20 | 40 |
| Swiss Chard | 20 | 40 |
| Vegetables, Roots, Etc.— | Yolks | Whites |
| Apples | 62 | 12 |
| Mangel Beets | 19 | 18 |
| Mangel Beet Leaves | 28 | 16 |
| Onion | 11 | 25 |
| Potatoes | 55 | 15 |
| Turnips | 26 | 16 |
| Pumpkins | 22 | 23 |
| Dried Beet Pulp | 205 | 148 |
| Stale Bread | 190 | 131 |
| Dry Forage— | Yolks | Whites |
| Alfalfa Hay | 140 | 180 |
| Clover Hay | 132 | 113 |
| Cow Pea Hay | 114 | 71 |

It is very dangerous to feed heavily on millet seed or cotton seed meal. Poultry will not eat dry alfalfa meal if they can avoid it and we do not recommend that. Scalded alfalfa hay is much better.

## FIND SUBSTITUTES FOR WHEAT

As long as shrunken and damaged wheat or corn is available and can be bought at reasonable prices, we prefer the use of one or both. The time may come when the government will also prohibit the use of corn. It is well to learn to make substitutions. We find it necessary to break our old feeding traditions and revise our rations to fit the feeds which are available. By getting rid of every unfit bird, by growing green foods, by avoiding lice and mites, by better marketing, by these and many other sensible practices, we will soon forget about the high cost of feed, in other words, it means greater efficiency and greater production at no greater cost.

## SOME POULTRY FOODS

One of the secrets of successful poultry feeding lies in a thorough understanding of the relative merits of the various grains and feeds, and the ability to select and combine the best one for the particular purpose in mind.

The various feeds which poultry eat can be divided into five classes. They are as follows: (1) Whole grains, (2) green feeds, (3) mill products, (4) animal foods, and (5) minerals.

In other words, no matter what combination of feeds you may use they should contain the five G's:

Grit
Grains
Greens
Grubs
Gumption.

## WHOLE GRAINS

**Wheat.** No other grain is so valuable as a food for poultry as wheat. It is not only that the single grain is the nearest to a complete food for poultry from the standpoint of the balanced ration, but its size, color, shape and freedom from outer covering or shucks make it very attractive to poultry, and they are very fond of it. For growing stock or laying hen it is much more valuable than corn, because it contains less oil and more protein. Owing to the fact that wheat always sells for a higher price on the market than corn, a great many farmers feel that they cannot afford to feed it to their hens. In this idea they are mistaken. They would make more money by marketing their corn and feeding the wheat to the hens. Wheat can be harvested and bound and then fed in the bundles to the fowls and they are compelled to thresh it out themselves.

**Corn.** Corn, in its various forms, is the most common of all poultry foods. A kernel of corn is from four to six times as large as a kernel of wheat, and contains, in proportion to its size, considerably less mineral matter and protein, and a great deal more starch and oil. It is not, therefore, nearly as good as a single feed as wheat. Owing to its commonness and cheapness, as well as to its palatability and feeding value, it should form an important part of all poultry rations. Best results are obtained by feeding corn, cracked coarse for adult fowls, and fine for growing chicks. Cracking not only makes corn more easily digested, but it makes it less easy for the poultry to quickly make a full meal of it without exercise. There is no difference in the feeding value of yellow corn and white corn. Yellow corn is preferred by some, however, for fattening fowls for market and for feeding for eggs, because it gives its color to the fat of the birds fed on it, to some extent, and to the yolks of their eggs.

**Oats.** It is hard to lay down any general rule as to the value of oats as a poultry food, owing to the fact that oats are more variable in weight and quality than any other grain. Good heavy oats are very nearly as valuable as a poultry food as wheat, while light oats, which are mostly hulls, should not be used. The fibrous hull of the oat seems to make it less palatable to poultry than most of the other grains. However, they will usually eat good oats freely, and for the sake of variety these should form a part of the ration. Hulled oats, where they can be secured at a reasonable price, are splendid for growing stock. One of the best methods of feeding oats is to run them through a feed mill and grind them, hull and all, and then feed them in a hopper as a mash or mix them with other ground feeds. There is often considerable danger in feeding oats with hull on them, especially if the oats are light and the hull is heavy and bearded. But they are a splendid feed if fed hulled or ground.

**Boiled Oats.** Some who have tried boiling oats, seem to like to feed them after boiling better than any other way. They claim it softens the hulls so that the chickens have no trouble in digesting them, the chickens relish them, and they swell up and make about twice the quantity of feed. The boiled oats might be mixed with the moist mash and fed between one and three o'clock in the afternoons.

**Kaffir Corn.** During the past few years in certain parts of the west and southwest, the production of kaffir corn has increased very rapidly, and its fame as a poultry food has increased at the same rate. Showing about the same food value as common or Indian corn, its smaller size makes it much better adapted for a food for poultry. The Oklahoma Experiment Station found kaffir corn to give better results when fed to poultry than when fed to any other kind of live stock. In those sections of the country where it is raised, it has practically taken the place of corn as a poultry food. We consider a good grade of Indian corn better, if available. Kaffir corn, however, is a good substitute.

**Rye.** Rye is not a success as a poultry food. Just why is an unanswered question—except that the hens just simply do not like it. Rye contains nearly the same feeding values as wheat, is hull-less, and nearly the same size as wheat. Yet, on account of some objectionable or medicinal flavor, it is eaten very reluctantly by poultry. As long as we have other grains which they like from which to make our rations, there would seem to be no reason to justify our use of rye as a poultry feed.

**Barley.** Barley contains a little less protein than corn, and a little less than wheat or oats. It makes a very satisfactory poultry food, and in spite of its shuck, is fairly well relished by hens. It is not a common poultry food, owing to the fact that it is grown only in restricted areas where it is in great demand for brewing purposes. In those parts of the country where it is grown, however, it is largely used as a substitute for both corn and wheat.

**Buckwheat.** The chief value of buckwheat as a poultry food is in giving variety to the ration. For this purpose, it is used quite commonly in the eastern part of the United States, where it is most generally grown. It has no qualities to recommend it in preference to other grains, other than the one mentioned above.

**Sunflower Seed.** Sunflower seed contains more protein than wheat, and much more oil than any of the grains mentioned in this lesson. Sunflower seed is especially valuable when fed in connection with other grains during the moulting season. It seems to enable the hen to feather out more rapidly, and adds lustre to the plumage. Owing to its richness, it should be fed with care.

## ANIMAL OR MEAT FOODS

The hen is an omnivorous creature. That is, she eats both vegetable and animal foods; and she must have both if she is to keep in perfect health and give the best results. Where poultry is allowed free range on the farm, their animal food consists of the bugs and worms which they pick up. One of the reasons why egg production drops off as winter comes on, is because the supply of bugs and worms is no longer available. It is then that we should begin to furnish a substitute for the meat diet which the hens have been enjoying during the summer months.

**Green Cut Bone.** Green cut bone is generally considered the best meat feed which we can give our hens. It is made by grinding fresh bones with particles of the meat adhering in grinders made for that purpose. Its use is not general on account of the difficulty of securing a regular supply of bones that will warrant the purchase of a grinder. It must be fed sparingly and one must make certain that the bones and meats are not tainted. The correct amount is not more than half an ounce to each mature fowl each day.

**Beef Scraps.** Good beef scraps are a packing house by-product made by cooking, drying and grinding lean meat. Its value as a food for poultry lies, not only in the fact that it is animal food, but, also, in the fact that it is very rich in protein, making it very valuable in balancing rations. The odor of good beef scrap is not offensive. When scalded, it should have the odor of cooked meat, not of fertilizer. The cost of beef scraps may seem exorbitant, but you could not afford to be without some meat food at twice the price. Two extra eggs per month will pay the cost of a good grade of meat scraps.

**Milk and Buttermilk.** These are properly classed as animal foods. Skim milk, either sweet or sour, and buttermilk, are splendid for poultry of all ages and conditions, and should be given wherever possible. The nutritive ratios of both are very narrow, being in the neighborhood of 1.2. They are, therefore, very valuable in balancing the rations which the various grains render too wide. There is no better food of any kind for poultry than skim milk, sour milk, or buttermilk. It will pay much better to feed it to poultry than to hogs. It matters not which kind of milk you use, but you should confine yourself to one kind and not feed sour milk one day and sweet milk the next. Buttermilk, also, is put up by some manufacturing concerns in a dried state or powdered form, and in a condensed form. There is more or less value to all these products.

## EXPERIMENT STATIONS RECOMMEND BUTTERMILK FEEDS

In a year's feeding test conducted by Prof. A. G. Phillips of the Purdue University, Lafayette, Ind., it was found that feeds containing dried buttermilk produce far better results than similar feeds where liquid buttermilk was used, or from feeds containing no buttermilk.

The pen fed dried buttermilk had a greater income and a larger net profit than the pen fed liquid buttermilk or the pen that was fed no buttermilk. The feeding value of dried buttermilk proved to be $50.10 per 100 pounds more than the feeding value of liquid buttermilk. The fertility of the eggs or the hatching power of the eggs was far greater from the pen that was fed dried buttermilk than from either of the other two pens. It was stated by this Experiment Station, in their official bulletin, that "the dried form of buttermilk is as good, if not better, than the liquid form, as a means of supplying animal protein."

Lewis, in Vol. III, No. 4 Journal of the American Association of

Instructors and Investigators in Poultry Husbandry, reports feeding five pens of fowls over a period of two years. In this experiment, various protein concentrates of vegetable origin were compared with beef scrap; this was the only difference in the rations.

| | Per cent production 1st year | Per cent production 2nd year | Per cent Mortality |
|---|---|---|---|
| Pen 42—Beef scrap | 32.3 | 24.17 | 12 |
| Pen 43—Soy bean meal | 12.3 | 21.68 | 26 |
| Pen 46—Gluten meal | 10.7 | 17.67 | 24 |
| Pen 47—Oil meal | 6.54 | 17.05 | 32 |
| Pen 48—Cottonseed meal | 9.4 | 14.55 | 32 |

In conclusion, Mr. Lewis states that the pen which was fed meat scraps in the above test proved to be the most efficient, nearly doubling the next highest pen, which was fed soy bean meal. The mortality was less in the beef pens and highest in the oil meal and cottonseed meal pens.

1. Meat scrap and milk in some form are the most economical sources of protein for laying hens.
2. It is poor economy not to furnish the laying hens a protein concentrate of animal origin.
3. Vegetable proteins alone cannot be fed economically.
4. The production of birds which are fed animal food is more uniform than that of those which do not receive it.
5. Twenty-five per cent meat scrap is a sufficient amount of animal food in a dry mash.
6. There is no evidence that vegetable proteins, alone or in combinations with animal food, increase egg production.
7. One pound of egg can be produced with every four pounds of feed if the proper ration is fed.
8. According to tests, 100 pounds of sour milk is worth 5.4 pounds of meat scrap.

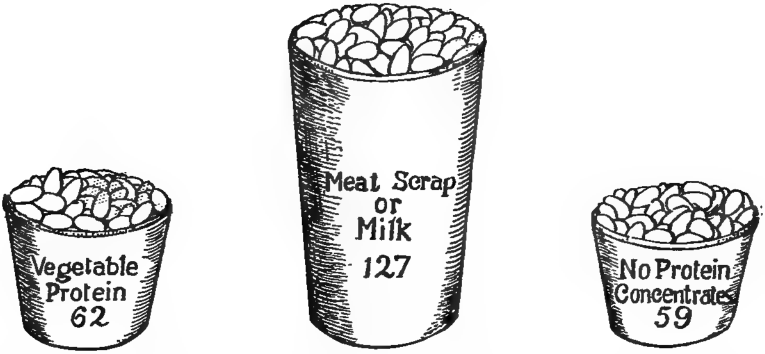
## SUBSTITUTES FOR BEEF SCRAPS

On both the eastern and western coasts we would advise letting fish scraps or fish meal constitute at least 50 per cent of the animal food, providing fish meal can be bought for less than beef scraps. On the general farm, or where possible, it is advisable to give the birds free range. They will pick up a large part of their own living from waste products, and worms and insects will supply the largest part of the necessary meat food. We know of a number of poultrymen, who, instead of buying beef scraps, fish meal or green bone, will buy bones from the meat market. These are put in a large kettle and boiled. The water from same is rich in food value, as it is the same as beef soup or broth. A little salt is put in to add flavor. The bones are removed after the substance has been boiled from them. Mix some bran, shorts and corn meal with the bone soup and you have one of the best foods in the world. You do not need beef scraps or fish meal in that case. A large quantity of this can be boiled at one time. If you do not care to feed it all at one feeding it will keep for several days. Use just enough to moisten your mash each day. Milk in any form is a good substitute for beef scraps.

## FISH SCRAPS

Fish scraps are not equal in value to a high-grade of beef scraps for poultry. Poultry eat it and seem to relish a good grade of fish scrap, but in all the experiments we have made it did not prove so good in feeding value or give quite as good results as a good grade of beef scraps. It is a very good substitute when the other is not obtainable. We much prefer, however, a good grade of fish scraps to a poor grade of beef scraps. We do not use either when we can get sweet or sour milk. We never use fish or beef scraps that appear to be no better than common fertilizer.

## MEAT SCRAP AND SOUR MILK FOR EGG PRODUCTION



Results from feeding no protein, vegetable protein, meat scrap and milk.

### NEW USE FOR BUTTERMILK

Buttermilk has been proved a cure for one of the two most fatal diseases of young chicks—coccidiosis. This announcement has been made by Dr. J. R. Beach, assistant in veterinary science at the University of California.

This costly disease of coccidiosis is caused by the tiny protozoon organisms known as coccidia. Usually the chicks thrive until they are a few weeks old and then begin to droop, and often whole flocks of chicks die within a month or six weeks after the appearance of the disease.

An outbreak may be controlled, however, by sanitary measures and by proper feeding. The sickest of the chicks should be isolated from the others or killed and burned. The chicken house should be cleaned with a strong, hot, disinfecting solution. The floors should be covered with a thin litter of shavings, chopped alfalfa hay or straw and this should be swept out and burned daily. Feeding and drinking vessels should be kept scrupulously clean.

The method of feeding is very important. The infected flocks of chicks should be fed a small amount of grain night and morning and mash during the middle of the day, but this mash should not be offered for more than two hours daily. Buttermilk should be kept before the chicks constantly. This restriction of the grain ration will keep the chicks hungry, and they will consume large quantities of buttermilk. The result will be the constant presence of acid and a healthy condition of the mucous membrane of the intestines, which will prevent the multiplication of the coccidiæ which cause the diseases.

In January of one year the University had an outbreak of this disease in a flock of 730 two-months-old chicks. Already 60 per cent of the chicks were visibly sick when the disease was discovered. The infection was unusually severe. Use of this buttermilk method brought about immediate improvement. In less than three weeks all evidence of the disease had disappeared with only a 5 per cent death rate. In spite of limiting the grain ration the chicks made normal growth on a diet primarily of buttermilk.

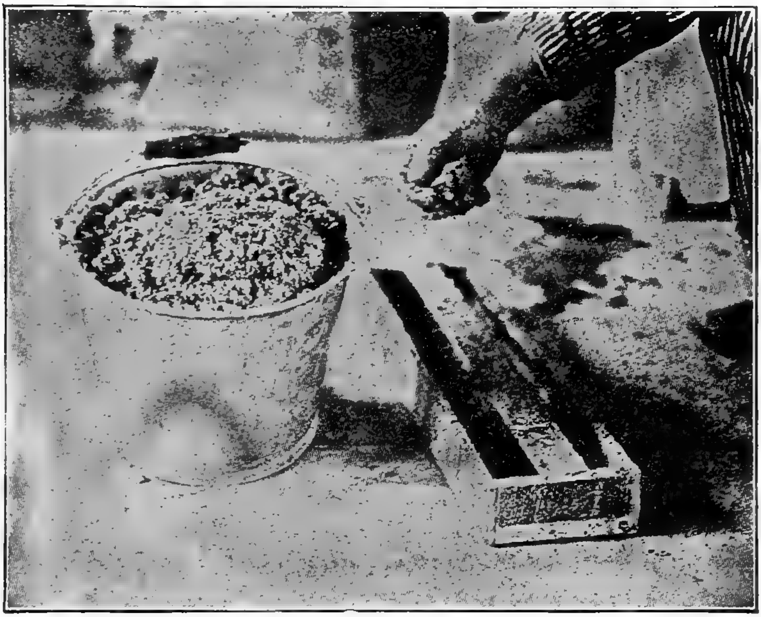
### MILL PRODUCTS

The various mill products form an important division of our poultry feeds because they enable us to balance our rations, and furnish part of the ration in concentrated form. For these purposes there are several mill products that are vaulable. They are as follows:

**Wheat Bran.** Wheat bran, which is the outer covering of the wheat berry, removed in the manufacture of flour, is the most common, as well as one of the best mill products used in poultry feeding. Good bran is richer in protein than either whole wheat or oats. It is the best material to add bulk to more concentrated feeds so that the stomach juices may act readily upon them.

**Middlings.** (Sometimes called shorts.) Middlings is the name usually given to a mixture of fine bran and coarse flour, which is another of the by-products in the production of high-grade flour. Its value lies in the amount of protein, largely in the form of gluten, which it contains. It is used in compounding mashes of various kinds, as we shall see later. It is even better than the bran.

**Corn Meal** is corn ground very fine, but coarser than flour. It is nearly the same in chemical analysis as whole cracked corn. It forms the base of fattening foods, for the reason that it absorbs the buttermilk or liquid mixed with it, it saves the hen the delay in grinding before digestion, and is very rich in carbohydrates and fat.



A bucket of moistened mash. Chickens of all ages relish this. Moisten the ground feed by the use of skim milk, sour milk or buttermilk; it does not matter which kind you use. It is best not to use sweet milk today and sour tomorrow. If you cannot get milk, then use water. Never make the food sloppy, but just crumbly.

**Gluten Meal** contains the gluten and parts of starch and oil of corn. It contains in a concentrated form, the proteins of corn and phosphate of lime. In compounding mashes, we prefer to increase the protein by adding gluten meal or feed rather than by adding cotton-seed meal or bean meal. In the preparation of the gluten the corn is first steeped or soaked in water, rendering it a soft mass. It is ground and then, by separation processes of sifting, washing, sinking, filtering and settling, the corn is finally separated into its component parts—corn starch, corn oil, and corn gluten feed. The corn starch and corn oil are refined into products for human food and for manufacturing purposes, while the feed, which is the remainder of the kernel becomes this concentrated corn product, containing the gluten or protein of the corn and its calcium phosphates, together with corn bran. In other words, it is the original shelled corn, after taking out part of the oil and starch. Seven thousand bushels of shelled corn yield about 2,000 pounds of corn gluten feed, or about 6½ bushels of corn are required to make 100 pounds of gluten feed.

**Dairy Chop** is corn which has been ground finer than cracked corn or corn chop, but is coarser than corn meal. It answers the purpose of corn meal and is usually cheaper.

**Oatmeal.** Oatmeal (rolled oats), where it can be obtained at a reasonable price, is a very valuable addition to the ration of laying hens and growing chicks, especially the latter. It is the oat, with the hull removed, rolled out flat.

**Linseed Meal.** Linseed meal is a by-product in the manufacture of linseed oil. The oil is extracted by two processes, known as the "new" and the "old" processes (commonly called "oil meal"). It is a very concentrated feed and should be used with great care, never exceeding over 5 per cent of the ration. It is laxative in effect, rich in feather-forming elements, and a valuable addition to the ration, especially during the moulting season.

**Old Process Meal** (O.·P.) contains a larger percentage of fat than New Process meal and is richer in protein than New Process meal. It supplies a large percentage of oil which gives it value in aiding the birds during moult.

## COTTON-SEED MEAL

Beef scrap has been for some time recognized as the chief source of protein for fowls. Much work is being done to find if vegetable protein is as effective as animal protein in the production of eggs and in the growing of young stock. The Rhode Island Station has been working for a number of years comparing cotton-seed meal with beef scrap. Their final conclusion has been that cotton-seed meal has no toxic effect on young fowls. They state that there is a difference in palatability, but when they consume the same amount of cotton-seed meal protein as they get of beef scrap protein the results in growth are about the same.

Three of the southern stations have reported very good results from the use of cotton-seed meal. It is a southern grown product and the protein can be bought much cheaper in cotton-seed meal than in beef scrap. I do not advise complete elimination of beef scrap in rations in the south, but small quantities of cotton-seed meal may be used with profit, both in egg production and in the growing of chicks. I warn you to be very careful in feeding it. Some poultrymen use cotton-seed meal as a litter. It should never be used for this purpose. The hens will consume too much of it and the mortality among young birds will be increased. Neither would we use the cotton-seed hulls as litter.

## LIMIT COTTON-SEED MEAL FEEDING

I have tried many methods of feeding cotton-seed meal. I have had it tried and seen it tried by others. I am thoroughly convinced that it must be used with caution and fed only in limited quantities if fed at all. You doubtless know that it contains a poisonous property for hogs and cattle which manifests itself if fed too freely. So use caution and judgment.

Nineteen tests were made by Dr. Kaupp in feeding cotton-seed meal and he finally arrived at these conclusions:

1. Cotton-seed meal in dry mash constituting 10 per cent of the mixture for laying and breeding stock for a space of 90 days in nineteen flocks of birds, has shown no noticeable physical effect. They apparently eat it with relish. This mash is given along with a morning and evening scratch feed and acts only as an adjunct.
2. Cotton-seed meal constituting 20 per cent of a fattening ration in seven tests proved unpalatable and the birds, having a tendency to become sick of it, did not eat sufficient to make satisfactory gains and in some cases actually lost weight when kept on it for a period of 18 days.
3. In cram feeding of 12 birds, four, or 33 1-3 per cent, were thrown completely off digestion, as evidenced by the food remaining in the coop. Three died and one later digested her food again.
4. Twenty per cent cotton-seed meal in one cram test did not produce satisfactory gains, due to its ill effect, in this quantity, upon digestion.
5. In two tests upon three Leghorns, gossypol apparently produced the same results as were noted in the cram feeding and other lots.

6. In the trough feeding, which proved unsatisfactory gains, the maximum amount of cotton-seed meal consumed was slightly less than one ounce a day.

7. In the cramming work the maximum amount of cotton-seed meal was slightly in excess of two ounces a day.

8. It was noted that birds of weak constitution and delicate appetite are the first to become affected.

9. All through this set of preliminary tests it was noted that as soon as the quantity of cotton-seed meal consumed reached about one ounce or more per day they may become sick.

10. A bird sick of cotton-seed meal will usually eat grain such as corn, wheat or oats, unless the effect be so aggravated that the food remains in the crop.

## FEEDING CONCENTRATES

In making a ration the average poultryman usually considers only the protein, carbohydrates and fat. We do not give enough consideration to the supply of ash and mineral matter, and also even neglect the water. In calling attention to this, Mr. L. E. Keyser said:

"When feeding linseed, cotton-seed or gluten we often fail to obtain the results we deem we should from feeds carrying such high protein contents. In some cases we make our ration too narrow and much of the protein in these feeds is not made use of. This, I am fully convinced, is because of the lack of phosphoric acid. To prove this I have for some time been carrying on feeding experiments and find that the protein in the vegetable feeds, such as above noted, can be made almost as efficient as the protein secured from animal sources. My plan is to first mix such feeds with half their weight of bone meal. Bone meal of good quality carries about 23 per cent protein and 25 per cent phosphoric acid. So, should I desire to use gluten feed, which carries about 23 per cent protein, the addition of 50 per cent bone meal does not change its nutritive value. Should I use cotton-seed meal, which carries 37 per cent protein, the addition of half its weight of bone meal would give the mixture a protein content of 32 per cent. Too much protein is almost as bad as too little. It burns out our hens by destroying their digestion and overtaxing their powers of assimilation. We must consider the mineral, as well as food nutrients, in feed and remember that all growth, both animal and vegetable, is largely dependent on three important elements—nitrogen, potash and phosphoric acid."

## STALE BREAD

Many poultrymen are located near large cities where stale bread can be secured from bakeries, hotels and restaurants at a very low price. This can often be purchased at a less price per pound than wheat. It is about equal to whole wheat in feeding value. We would have no hesitancy in using such a product if it is not moldy and if you are certain no chemicals have been used in its manufacture. Very often you can economize on the feed bill by contracting for such foods as this.

## SALT

We urge the addition of one-half to one pound of salt to every hundred pounds of mash used, whether dry or moistened. This seasons the food and makes it more palatable. Poultry needs some salt in its food for the same reason that we need it in ours. It aids digestion, and in some cases, helps rid the gizzard of objectionable worms. You should make certain that there are no lumps in the salt. Too much salt or brine is injurious and often deadly to poultry, but at least one-half of a pound should be used in every 100 pounds of mash, whether for old or young stock.

## MINERALS

### GRIT

Oyster shell does not take the place of grit. Fowls that have free range can often find most of the grit they require, but a good grade of grit can be bought very reasonable and it should be kept before the fowls.

The food they consume goes to the crop and is held there for a time and softened. Then it makes its way through the stomach to the gizzard. The purpose of grit is to supply the gizzard with material with which to grind the food. Because the fowl has no teeth, some way must be provided for it to grind the food before it can be digested.

These small stones or grit are confined in the gizzard for that purpose. If a fowl has no access to grit and is fed exclusively on hard, whole grains, the bird will more than likely starve to death, even though there may be a ton of grain to which it has access. We often find emaciated specimens, which look as if they were diseased, and upon investigation find the soil is free from grit and none has been supplied. The birds were fed an abundance of hard grain, but they were unable to grind it and render it available for digestion.

### SHELL

Oyster shell, crushed to a convenient size for hens to eat, is the most popular method of supplying material for egg shell. Some feed a ground oyster shell mixed with the mash. There is no particular value in feeding oyster shell to young stock. This is intended principally for laying hens. It should be kept before them at all times.

### CHARCOAL

We often feed this ground and mixd with the dry mash, but the most common practice is to keep it in a hopper where the birds can make use of it when needed. When fed in a hopper we feed charcoal which has been crushed into particles ranging in size from a grain of wheat to that of a grain of corn.

The object in feeding charcoal is to aid in maintaining and improving the health of fowls. It sweetens the crop, the stomach, the gizzard and the intestines, and aids digestion. It absorbs objectionable gases and is a blood purifier. Like grit and oyster shell, it is not expensive.

### USE LIBERAL SUPPLY OF GREEN FOOD

Green food can constitute 25 per cent of your ration. By this we do not mean alfalfa meal, or tough and dried grasses, but tender succulent green food. Clover, mangel beets, swiss chard, kale, cowpeas, lettuce, cabbage or any tender, crisp vegetables or cuttings from your lawn or garden can be used. Tough, fibrous, undigestible green food will not do and might just as well not be fed. If this green food can be run through a root cutter or grinder of some sort and then mixed with a little dry mash, the hens eat it with a relish. Cook the discarded vegetables and garbage and then mix some dry mash with it. Have a large iron kettle or pan for this purpose. Boil your vegetables or scraps in this and then mix the mash right in with the contents of the kettle. There is no necessity of wasting a single thing from a single American home if this is done. A few hens kept in the back yard and fed this way will pay a neat profit. If green stuff and garbage is fed in this way, the hens will relish it, your feed bill will be cut down and your egg yield increased. Remember, that it freshens and sweetens the greens and they are made more digestible if they are run through a grinder. Treat your vegetable tops, leaves and discarded vegetables in this manner. Dandelions from the lawn, radish tops, lettuce, cabbage or most any sort of waste, weeds or vegetables will be relished by the poultry if run through a grinder or fed when tender or after they have been boiled. Clover should be steamed or scalded and then cooled and the water used with which to moisten the mash. Late cuttings of alfalfa or clover hay make valuable green food and can be fed in the dry state if you do not have time to scald or steam it.

The importance of green food for poultry, either old or young, cannot be overestimated. It has a value that the chemist's analysis cannot show. There is something about green food that keeps the system in perfect condition and wards off disease. For want of something better, we say it is because green food is succulent. We are all familiar with the improvement in the condition of the cows and horses when they are turned out on pasture in the spring, and the marked increase in the number of eggs shortly after the grass begins to get green. To keep in the best of health, fowls need succulent greens, but if too much green food is given laying hens, they get too much fiber, and, therefore do not have the room or capacity for sufficient egg building material.

On the farm, where the poultry have free range, they do not lack for green feed during the summer, late spring, and early autumn.

In order to furnish a supply of green feed during the winter months, we should grow a bountiful supply of roots, such as mangles, sugar beets, etc. In the absence of a supply of roots and vegetables, sprouted oats may be used with splendid results. The egg production of farm flocks given a feed of sprouted oats daily during the winter will increase several per cent, and the flock will go into the spring hatching season in much better condition than they will if green food is not included in the ration.

The necessity of green food is shown by the fact that you may turn a flock of chickens in a small yard and they will eat every weed and sprig of grass. They eat the weeds as fast as they can sprout and there is not a weed on the farm, lawn or in the garden that may not be utilized as poultry food, if in form to be eaten.

Swiss chard is worth trying out on farm and village lot, as it gives a long series of cuttings, and New Zealand spinach is a mighty nice plant to introduce into your list of home specialties. This spinach is best seeded in the spring and broken off and fed as it grows. It remain green longer than any spinach I ever tried, and makes the best of salad for the home table.

The Swiss chard will appeal to your hens and a fourth of an acre will supply enough green food for 1,000 to 1,500 hens.

Large summer egg production is seldom had where hens are not freely allowed to eat growing green stuff. Clover and alfalfa in winter, as well as succulent green food in summer, are needed to offset some of the increased cost of other foods that must be bought for your hens and chicks.

It may not be safe to rely on lawn clippings, but have the other succulent foods to cut and feed as required.

In the absence of any of these green, growing, live, succulent foods I would advise the use of dried beet pulp. It can be bought in one hundred pound lots, should be soaked in water for a few hours before using, and should be watched lest it sour while wet and left over in the feeding. Soak and use the same day. Underfeed rather than keep too long before the hens—lest they get an upset digestion because of the spoiled pulp.

## ENSILAGE

Ensilage, such as is used for dairy cattle, is a good food for poultry. We have known many dairymen who never fed their poultry anything in winter but ensilage and milk. The poultry did well and laid a large number of eggs. We have never had any bad results from the use of ensilage for poultry unless it was moulded or the hens were confined to pens. In such cases you will have a lot of sour crops and cases of crop bound. Therefore, never feed ensilage to birds unless they are on free range.

## GROWING GREEN FOOD

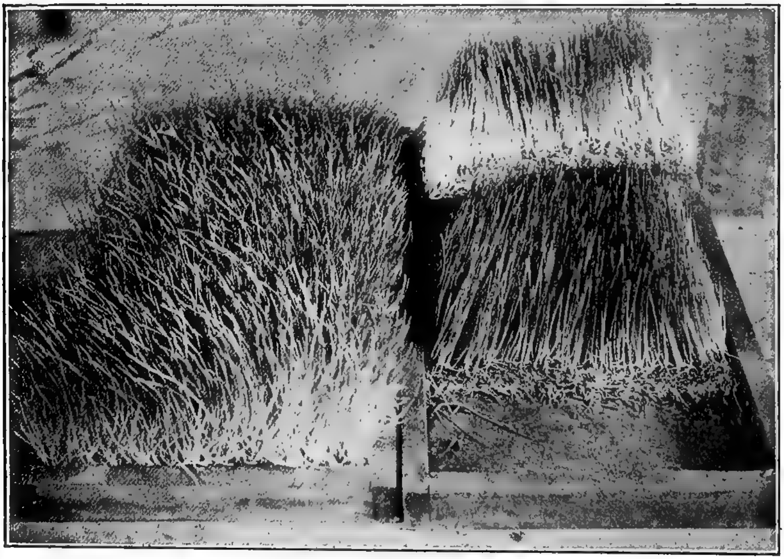
The yards should be cultivated, anyway, for best results and in order that the poultry may be kept on fresh soil, and while we are doing this we might as well grow a great quantity of green food. Wheat makes a good green food for poultry and they like it much better than green rye. Oats, cow peas and soy beans are also good. Swiss chard and rape make the best continuous growth. You can allow fowls to eat the leaves from the main stalk, or cut them, and a new growth will start again. Mangel beets make a splendid food. They should be stored in winter, so as to prevent them from decaying or drying out. Cut them in halves and stick them on a nail on the side of the wall in poultry house. The fowls will do the rest. A small lot in rape, Swiss chard or mangels will grow a large quantity of feed. Cabbage is also relished by poultry.

## GROWING SOMETHING IN YOUR SOIL

Where poultry is raised on back lots, the customary practice of useing a number of small yards for small matings is hardly practical. For example, using three small lots which are always bare; it would be better to divide the space into two yards and allow the flock to run together. While they are using one yard, spade or plow the other and grow some green food in it. Sow it to rape, kale, Swiss chard, wheat or something of this nature. This will supply you with an abundance of green food, will cut down your feed bill and at the same time sweeten and purify your soil. In the yard which is occupied by the chickens, if you will take a spade and turn over a few shovelfuls of earth every few days the chickens will work in that, will get a lot of fun out of it, and will find insects and particles of food which they relish.

## PROFITABLE TO SPROUT OATS

Another method of supplying green food and, also of producing a very cheap feed is to sprout oats. If you properly equip yourself for it, you will be surprised at the amount of food that can be grown by this method. After oue bushel of oats are sprouted it will make over two bushels of feed. We soak the oats for two hours, spread them out in trays until they are about one inch in depth, sprinkle them each day to keep them moist and feed them when they are about a week old. Do not use any artificial heat in sprouting, unless you have a reliable sprouter made for the purpose, and the oats will not mold. If you feed the oats when they are about a week old from the date you started them, you get the benefit of the oat grain as well as the tender succulent sprouts. I do not know how you can grow any more valuable feed at less cost and with less labor than by this method. Some of the best home-made devices for oats sprouting and the best methods for doing same are fully explained in our appliance lesson, No. 5.



A Tray of Sprouted Oats

## ALFALFA AND CLOVER

These are two of the best green foods for poultry, when fed before the hay matures or ripens. These make fine pasture for poultry or may be cut while green, and immature or succulent, and fed to the poultry by throwing a portion of it into the pen so the chickens can pick the leaves and stems. Cow peas, soy beans, rape and kale also make very desirable green food.

### A SUBSTITUTE FOR GREEN FOOD

If your yards are bare, or if it is in the dead of winter and you have no available green food, the following has been recommended as a very good substitute:

| | |
|---|---|
| Table salt | 1 oz. |
| Epsom salts | 3 ozs. |
| Copperas dried | 12 ozs. |
| Calcium hypophosphite | 1½ lbs. |

Keep these dry and mix them thoroughly. Use about three level teaspoonfuls to each two gallons of drinking water. Mix with a stick or wooden spoon. Keep this in the drinking water at all times when short of green food. Keep the ingredients from the air by keeping the mixture in a glass jar which has a screw top. While this may be better than nothing, yet there is nothing that will act as a substitute for the actual succulent greens themselves.

### FEEDING RAW IRISH POTATOES

In handing some of the large poultry shows of this country, and in acting as secretary and superintendent of same, I have had letters from some of the prominent exhibitors in which they made the request that when their birds were returned home not to put either grain feed or water in their shipping coop. They requested that I cut raw potatoes in quarters and place a supply of them in the coop. This led me to investigate the value of potato feeding. I am of the opinion that, when run through a meat grinder or root cutter and fed to young chickens or older fowls, they are relished and have considerable feeding value. Small potatioes can be disposed of in this manner to advantage.

One of the most ardent advocates of the use of potatoes has been Dr. P. T. Woods. His suggestion may be of value to you:

As a rule, chicks won't sit up and take notice of raw potato until three or four days old, but they get a chance to pick at small bits at will from the very first feed when they are about 48 hours old. In a few days they are eager for raw potato and appear to relish it more than anything we give them. They will leave chick food, cooked rice, and oat sprouts to eat freshly cut raw potato and will fight for it as long as the supply lasts. This is true not only of our own flocks, but of many flocks all over the country that have come under our observation or have been reported to us by correspondents. What is the reason?

Scrobutus is a malady rather common among young chicks but not often discussed with poultry diseases. It claims a good many brooder chicks each year as victims and we see the losses attributed to rheumatism, internal hemorrhage, and various other troubles, while the real cause is often overlooked.

Scrobutus, or scurvy of brooder chicks is dependent largely upon a diet deficient in raw vegetable food. Close confinement in the brooders, failure to get chicks out on the ground sufficiently early, insufficient fresh air, filthy and unsanitary brooders, are all contributing causes. Hen hatched chicks sometimes have the disease from similar causes, but are less often affected because they usually have an outdoor run where raw vegetable food, in the form of succulent green grass, is available.

The more prominent symptoms are: Debility, anemia (lack of red blood, paleness or blueness of skin and blood vessels), discolored spots on skin, like "black and blue marks" from extravasation of blood into skin tissue, bleeding from intestinal walls, causing blood stained droppings, and still more noticeable are the swollen legs, enlarged blood vessels in legs, and sometimes loss of use of legs or partial loss of use of them from hock down. Sometimes all of the other symptoms may be absent or not noticeable except the swelling often confined to the shanks and hocks. The loss of use of legs resembles paralysis, but is seldom complete. The chick can usually scramble along on its hocks and shanks, or has "leg weakness" or is "spraddle legged." This condition has been described as "cramps," rheumatism and phlebitis, but we believe that in many, if not in most cases, scrobutus is the correct diagnosis.

In raw potatoes we have one of the best natural antiscrobutics available for chick feeding. It is well known that fresh raw potato pulp will give immediate relief in cases of scurvy in human beings and that it will eventually effect a cure if the victim is not too far gone. Free use of potato will prevent the disease and secure immunity for the favored one in a community afflicted with scrobutus. Raw potato fed to chicks will prevent scrobutus in chicks when properly managed, and will cure cases of the malady when not too far advanced if attention is given to providing a suitable diet for the chicks.

We feed raw potatoes in small quantities daiy to young chicks, especially when grass and fresh green stuff are scarce, and believe that it helps to keep them in good condition and to assimilate their other food. They relish it and are eager for it. The potato possesses something more than is shown in mere chemical analysis. It is made up of a multitude of living cells and food for living cells. Fed raw, it supplies a living food that is not to be lightly set aside in the matter of real worth. Every potato possesses the essentials of several embryo potato plants, each capable of growing under proper conditions into a mature plant and producing more tubers. This live or vital food property does not appear in the analysis tables, but it is there and it will help you to grow more and better chicks if you use it properly. You may not see that every flock is benefited, but we believe you will find, if you are at all observing, that raw potatoes are a well relished and valuable succulent food for early chicks and for adult fowls when other vegetable foods are not easily obtainable.

Bear in mind that potatoes and potato parings grow stale and lose feeding value rapidly after cutting.They should be fed freshly cut and only in a quantity which will be eaten quickly with relish. Feed potatoes should be kept in a cellar, or in some other dark place. Exposure to light for any considerable length of time causes the potatoes to turn green and develops a bitter principle that renders them unpalatable and, possibly, unwholesome. Perhaps this fact accounts for the belief of some people that potato skins are poisonous. Solanin, an alkaloidal glucoside, is obtained from the sprouts of the common potato and is sometimes used in medicine for a variety of nervous troubles. It has a bitter taste, neutralizes acids and forms salts with them. The mineral content of potatoes is small and, in a measure, dependent upon the character of the soil in which they are grown; the chief mineral foods obtained are salts of potassium and a small per cent of phosphoric acid. The mineral content probably adds to the antiscrobutic properties of the potato.

Feed raw potatoes freshly cut in slices or chunks, or run them through a vegetable cutter which cuts fine. Feed raw potatoe parings, when fresh, to either young or old stock. Govern the quantity by the appetite and relish shown by the birds. Don't be in too great a hurry to get results; the best ration of food on earth won't yield an immediate return. Be reasonable, feed raw potatoes reasonably often, and cooked potatoes occasionally for a variety food; and we believe you will be pleased with the results. But don't let inability to observe or prejudice make you blind to real merit. We believe that a fair trial will convince you that raw potatoes are good wholesome food for chicks or fowls, are well relished and when properly fed will prevent some common chicken ailments.

## GROWTH PROMOTING SUBSTANCES

"Who are the peoples who have achieved, who have become large, strong, vigorous people, who have reduced their infant mortality lower than the people who have used the type of diet first described, who have the best trades in the world, who have an appreciation for art and literture and music, who are progressive in science and every activity of the human intellect? They are the people who have patronized the poultry and dairy industries."

This is the statement made by Dr. E. V. McCollum, to a conference of men who are vitally interested in maintaining the poultry and dairy industries.

Dr. McCollum's work is invaluable to the poultry industry. He has given to the world a new knowledge of nutrition, which if applied in the family diet will do much to improve and maintain healthful standards of living.

Dr. McCollum's work led him to discover the vital elements in eggs. The world has always believed that eggs are a valuable food, but until he made known the facts concerning growth promoting elements, we were not able to give specific reasons for our belief.

The growth promoting elements are known as fat soluble A and water soluble B. These terms are indefinite; they do not mean much to the ordinary man. The names, however, are not permanent. When more knowledge is obtained regarding these elements, when more is known concerning their origin, their character, their full purpose, their chemical nature, other names will probably be adopted for them.

Some men call these growth promoting substances vitamines. This term is not satisfactory, however, and, until more is known, a definite name, upon which all scientists can agree, will have to be deferred and we will continue to use the terms "vitamines," "fat soluble A," "water soluble B." The public will have to recognize the terms as applied to mean the same thing.

No one knows, so far, at least no one has told the public, what fat soluble A is. That is the reason for its indefinite name. It is found in whole milk, in butterfat, egg yolk fats, glandular organs of the animal body and the leaves of plants. It is also found in limited amounts in roots and tubers.

The vegetable fats and oils such as olive oil, cotton-seed oil, peanut and cocoanut oil, although good energy yielding foods, do not furnish this dietary essential. The body fats of animals such as lard and beef fat are not important sources of the fat soluble A. No one knows what water soluble B is and very little is known about its habitat. It is known that it is not associated with any fat. Its existence in our common foods is not well enough known to assign to it a definite place. It is known, however, that our ordinary foods all contain several times the amount of the water soluble B which is necessary for the maintenance of growth and health in animals.

Of the normal presence of water soluble B, Dr. McCollum says that "If the diet is so planned as to furnish a suitable quota of eggs and cereals and other foods which are not so treated as to destroy the water soluble B, there is no danger of a shortage of this substance in the diet."

The use of soda in cooking vegetables or in making bread has proved to be detrimental to the element water soluble B.

Even though water soluble B is abundant in most of our foods, a diet composed of seeds and their products, tubers, roots and meats, notwithstanding we substitute the use of margarines and vegetable fats, does not furnish enough of the growth promoting elements to sustain the individual's well-being.

The belief is quite general that while the fat soluble A is necessary for proper sustenance and growth in the child, it is not necessary for the adult. This belief is not substantiated by facts. Both of the growth promoting elements are necessary in the diet of all people, and growing adolescents and mature adults need these elements if the most perfect well-being is to be obtained.

These two growth promoting elements are called unknown elements, because their true character is not fully known. It is known, however, that they are absolutely necessary in animal and human foods. The abnormal conditions accruing because of their absence have been carefully tabulated, with the result that fairly accurate deductions can be made from experiments with foods that do not contain them.

The absence of fat soluble A in the food results in the development of a condition of the eyes which appears to be rightly classed as a type of xerophthalmia. The eyes become swollen so badly that they are opened only with great difficulty, or not opened at all. The cornea becomes inflamed and unless the missing elements of the food are provided, blindness speedily ensues.

Many poultrymen often think that their young chickens and growing stock have bad cases of roup when many cases of sore and swollen eyes appear among the young stock. In most instances of this kind, the trouble starts from wrong methods of feeding and a lack of growth promoting substance in the feed given. If growth is properly stimulated and the food contains the proper developing materials the chicks will not be troubled with cases of sore eyes. In case you experience any trouble of this kind at any time, I would advise you to examine your feed and determine, if possible, whether you have the proper elements contained therein.

Dr. McCollum experimented with rats and guinea pigs for years and when foods were used that did not contain the growth promoting elements, the eye trouble explained above always developed.

He was not surprised, later in his experience, to learn that the same eye trouble had developed in hundreds of individuals in Japan. A famous physician there had studied the disease and found a remedy, but he had not located the cause of it. He found that a liberal consumption of chicken livers would cure the disease. He did not know that, because the diet of his patients did not contain the growth substances, the disease had developed.

Similar experiences are related by physicians from Denmark. The Danes are great butter makers. Previous to the world war, they held the balance of world trade in fancy butter. So intensely did they follow the butter business that they consumed skimmed milk in large quantities from which the butterfat had been separated and sold. The eye trouble of which Dr. McCollum speaks was common among rural children. The use of whole-milk, however, removed the trouble.

Beriberi is a disease common in the Orient among people who limit their diet largely to polished rice and fish. This disease develops because of the lack of water soluble B.

It seems probable that the only unidentified substance which is physiologically indispensable, which is not sufficiently abundant in the diets employed by the people of the United States and Europe where they are used in sufficient amounts of milk, butter, cream, eggs and leafy vegetables is the fat soluble A, but occasionally diets may be met with which contain too little of the water soluble B. Sufficient knowledge is not available to make it possible to select such foods as will mutually make good each other's deficiencies, and to combine them in such proportions as will insure the disappearance of all the diseases of man which are brought on by faulty diets."

These food principles are also applicable to the feeding of poultry. Feeders of livestock have depended upon a nutritive ration, based upon a chemical analysis and a determination of protein and carbohydrate content. It will always be necessary to know the extent of these elements in all foods, but in addition we will have to know whether or not the foods contain the growth promoting substances that have been found to be so essential to the human diet.

Whence do the growth promoting elements come? Are they part of the animal food which remains unchanged in the process of digestion —or, are they a glandular product? Can an animal store them up in the body and then give them off in proper amounts to the suckling young? Can eggs contain varying quantities of these growth promoting elements, and, if so, is there a good hatching egg and a poor egg from the viewpoint of the growth promoting elements?

These are questions that arise from a continuous study of these elements. Much work is still being done to answer them. The scientists are pretty well agreed that small quantities of fat soluble A can be stored in the fatty tissues and that egg may contain small quantities, but not enough to sustain the hatching chick and death in the shell results.

Dr. McCollum fed rats the perfect diet during the period of pregnancy, but at the birth of the young rats he began feeding diets which did not contain the growth promoting substances. The result of the experiment indicated that the young rats were not able to get enough of the fat soluble A element and growth was retarded. "In other experiments definite evidence is presented that this substance is not abundant in the milk unless it is present in the diet of the mothers."

Experiments also indicate that although fat soluble A may be in the food, if water soluble B is lacking, proper growth cannot take place." It seems certain that neither of these substances are present in abundance in the milk of the mother unless it is furnished in her food.

It is common knowledge that some mothers of children are not able to nourish the newly born babe. There are, without doubt, large numbers of women whose diet is such that the quantity of the milk is not such as to make it a satisfactory food for the infant and bottle feeding has to be resorted to.

"It should be thoroughly appreciated that the human mother should have in her diet a liberal amount of milk in order to safeguard the health and well-being of her infant, and of leafy vegetables which serve the twofold function of a protective food and of greatly aiding intestinal elimination."

The hen cannot put the growth promoting elements into her hatching eggs unless these elements are provided in the food of a brooding hen. The leafy parts of plants are the source of the supply and a portion of this substance is necessary. Alfalfa leaves and clover leaves are the best sources for this particular kind of substance. It is important that in the feed of a hen that we take into consideration the kind of green food that provides leafy substance in sufficient quantity to supply the hen's requirements in producing hatching eggs that will contain the vital elements necessary to cause the egg to hatch and to promote the growth of the chick after being hatched.

A great deal of attention is being paid today to building up improved strains of high producing hens and also to beautiful exhibition birds, but no matter how carefully you mate and breed your poultry, the proper growth and development will not appear in the offspring and the desirable traits which were inherited from their parents will not show up or be developed in the young unless proper growth and development is insured through the use of the right sort of feed elements. The proper breeding must be accompanied by proper feeds and proper growths. The fact was proven by Dr. McCollum, as stated above, that chickens will not grow normally on a diet of whole grains alone, consisting of corn, wheat or oats. These feeds are among the best, yet when a chicken is restricted to them it simply cannot grow as it would otherwise. These unknown properties which Dr. McCollum discovered and which are required and which have the power to make the chicken grow and develop normally have been termed vitamines.

It should be of exceptional interest to you and me, as poultrymen, to learn the available source of these products of vitamines. They are found in eggs, in the green leafy parts of plants and in milk. These feed products have been termed "Protective Feeds" because they are so constituted that they make up for whatever deficiency which may exist in rations composed of grain, seeds and by-products, with or without meat.

I have stated previously that there are two distinct types of unknown elements which exist in these so-called "Protective Feeds." The growing chick or animal does not show the proper growth or development without either of them. The first one of these substances is found to exist in eggs yolks and in butter fat. In order to prove the truthfulness of Dr. McCollum's statements we tried out some experiments along this line and find that chickens fed for a certain period on a good ration containing these products will grow normally. If all butter fat and egg yolk are withdrawn from the ration, growth stops immediately.

The tissues around the eyes will become swollen and in many cases the eyes will be entirely closed and the chicken develops a case similar to that of roup, and then if the deficient ration is continued the young chickens will soon die. If at any time within a few days before death butter fat or egg yolks are again supplied, the chickens will start development and the trouble with their eyes will disappear in most cases; and if the injury to the eye has not been of too long standing the chicks will soon appear normal.

The second element which is required is found in tender, leafy growth of plants. Chicks fed on a good ration and given plenty of succulent tender green food of the right kind will develop normally. If you withhold the second unknown quantity from the ration they will cease growth in a large majority of cases. They will not develop eye trouble as in the former instance, but in a few weeks or even a shorter period leg weakness, or some such condition of the legs, is almost certain to apepar. This condition can be corrected or avoided, in the majority of cases, if taken early enough, by feeding a proper quantity of tender leaves, such as clover, alfalfa, rape, kale, Swiss chard, celery tops, et cetera.

The third element which was found necessary is the use of at least a small quantity of salt in the ground feed. For young chicks we recommend not more than one-half pound to each hundred pounds of ground feed. With the older birds we would use from three-fourths to one pound in each hundred pounds of ground feed.

Professor Lewis of the New Jersey Experiment Station also made a test of the recommendations made by Dr. McCollum, and this is what he found and what he has to say concerning same:

"Eggs provide the same missing element in the growing ration which milk does, yet owing to their expense they cannot be extensively used. At Vineland the growing birds were fed all the infertile eggs taken from the incubators throughout the spring. Such eggs can be hard boiled and fed in mederate quantities, but be sure that they are cleaned up and not allowed to become sour and moldy. Eggs are highly palatable and are relished by growing birds. They also contain much digestible food material in addition to this unknown food property without which the young cannot grow.

"There are few poultrymen who have figures to show just what the normal rate of growth of pullets should be. The accompanying Table Number 1, compiled from experimental work at New Brunswick, New Jersey, during the past few years, gives in tabulated form the natural growth and development of young growing poultry which were cared for normally but which did not receive milk or milk products and were not given the advantage of luxuriant green forage. These figures were secured before our knowledge regarding the importanc of milk and green leafy plant growth was as well developed as it is today.

"Table Number 2 shows the gains made by the 2,000 pullets at the Vineland contest, cared for in such a way as to be given every benefit of our present-day knowledge regarding the value of these protective feeds. In addition to the following dry mash which was constantly available:

GROWING MASH

| | Pounds |
|---|---|
| Wheat bran | 300 |
| Wheat middlings | 100 |
| Ground oats | 100 |
| Corn meal | 100 |
| Gluten feed | 100 |
| Meat scrap | 100 |
| Dried buttermilk | 100 |

"Applying the results of these interesting discoveries to the practice of feeding growing poultry, we find the following products must be given special prominence in the diet: No effort should ever be made to raise chickens unless they can run over an extensive range on which an abundance of green feed is growing. In addition, the growing chickens should be fed liberal quantities of milk or milk by-products. Infertile eggs from the incubators can well be boiled and fed to the chicks during their early growing period. The inclusion of all these three products will insure vigorous, healthy, well-grown pullets which will develop their inherited traits and become productive, profitable adults.

"Chickens, like all young animals, require an abundance of leafy plants for a considerable part of their diet. Nearly every raiser of poultry remembers the experiences he has had in the past with leg weakness and slow growth. Green ranges provide the elements in the ration which prevent these weaknesses and which the chicks cannot get from any other source.

"We learn that milk products are equally essential because they provide another dietary property without which proper growth cannot be maintained. Skim milk is probably the best. It contains a limited amount of fat and much casein. Buttermilk is probably equally as good. In the absence of these two milk products there are a number of by-products, which are available. At Vinland, last season, semi-solid buttermilk was used until the chicks were nearly four months old. This product is buttermilk dried down to the consistency of cream, which can be diluted with water and fed as a beverage. Dry buttermilk was also fed throughout the growing period in the dry mash. Other dry products which can be used are milk albumin and milk powder; but with many the price is prohibitive.

"The question which will be asked by most feeders is the relative advantages of liquid vs. dry milk products and the advantages of sour vs. sweet milk. It can be said without hesitation that the liquid milk is probably superior to the dry powder, especially when feeding very young chicks. They seem to relish it better and it has a stimulating effect upon their appetites.

**Table No. 1**

Growth which chicks and pullets could be expected to make on limited range with restricted green forage and no milk.

| Age | Weight of 100 Chicks | |
|---|---|---|
| | American Breeds Pounds | Leghorns Pounds |
| Hatching time ...... | 8 | 8 |
| First week ........ | 10 | 10 |
| Second week ....... | 13 | 15 |
| Third week ........ | 21 | 23 |
| Fourth week ....... | 30 | 33 |
| Fifth week ........ | 41 | 42 |
| Sixth week ........ | 49 | 54 |
| Seventh weeks ..... | 65 | 71 |
| Eighth week ....... | 78 | 87 |
| Ninth week ........ | 93 | 102 |
| Tenth week ........ | 108 | 116 |
| Eleventh week ..... | 129 | 132 |
| Twelfth week ...... | 140 | 141 |
| **Pullets Only** | | |
| Thirteenth week ... | 150 | 132 |
| Fourteenth week ... | 164 | 151 |
| Fifteenth week .... | 193 | 172 |
| Sixteenth week .... | 218 | 188 |
| Seventeenth week... | 255 | 196 |
| Eighteenth week.... | 300 | 210 |
| Nineteenth week.... | 325 | 225 |
| Twentieth week..... | 338 | 238 |
| Twenty-first week.. | 360 | 262 |
| Twenty-second week | 370 | 281 |
| Twenty-third week.. | 381 | 297 |
| Twenty-fourth week | 385 | 301 |

**Table No. 2**

Growth which the chicks and pullets at Vineland contest made on alfalfa range, plenty of milk and the best of care. Spring of 1918.

| Age | Weight of 100 Chicks | |
|---|---|---|
| | American Breeds Pounds | Leghorns Pounds |
| Hatching time ...... | 8 | 8 |
| First week ......... | 10 | 12 |
| Second week ....... | 15 | 16 |
| Third week ........ | 24 | 28 |
| Fourth week ....... | 42 | 45 |
| Fifth week ......... | 62 | 68 |
| Sixth week ......... | 87 | 92 |
| Seventh week ...... | 105 | 112 |
| Eighth week ....... | 134 | 135 |
| Ninth week ........ | 155 | 150 |
| Tenth week ........ | 175 | 165 |
| Eleventh week .... | 190 | 173 |
| Twelfth week ..... | 204 | 177 |
| **Pullets Only** | | |
| Thirteenth week.... | 210 | 182 |
| Fourteenth week ... | 230 | 190 |
| Fifteenth week ..... | 250 | 205 |
| Sixteenth week ..... | 385 | 223 |
| Seveneenth week.... | 312 | 240 |
| Eighteenth week.... | 340 | 260 |
| Nineteenth week.... | 365 | 279 |
| Twentieth week..... | 377 | 304 |
| Twenty-first week.. | 390 | 315 |
| Twenty-second week | 402 | 323 |
| Twenty-third week.. | 405 | 329 |
| Twenty-fourth week | 410 | 335 |

"It is generally recognized that sour milk is superior to the sweet for two reasons: First, because the sour product, containing lactic acid, is slightly more palatable and acts as an internal disinfectant, cleansing the digestive tract and killing certain undesirable types of bacteria. Sour milk has been found by actual tests, at many experiment stations, to be more easily and completely digested than sweet milk. It is further impossible to feed the milk sweet all the time, for in warm weather it will sour quickly and it is unsafe to feed the product first sweet and then sour. The writer, after years of experience in raising thousands of pullets, can say without hesitation that he would question his ability to brood and rear successfully without a liberal supply of sour milk.

"They were given a scratch ration composed of equal parts of wheat and cracked corn. They consumed during the growing period practically equal parts of mash and grain and made the remarkable growths shown in the accompanying tables for pasture-milk fed and grain-fed lots.

"We are never too old to learn. New things are being developed constantly. The poultry grower, who keeps posted and up to date in his every practice, has the edge on his more conservative neighbor. Here is the lesson. Give the growing chicks an abundance of green range, preferably alfalfa or clover. Feed milk liberally as a beverage, supplemented with powdered buttermilk. Never let the infertile eggs from the incubators go to waste; boil them and feed to the chicks.

## AN EGG AND SHELL MAKER

The average poultry food does not contain enough phosphorus, ash, protein, or lime. These things are necessary for shell, yolk and for building bone. Zeitschrift der Phisologioche Chemie, Vol. 27, shows that the milk from various animals varies according to the growth the young makes and the length of time it takes to vary its weight. The table shows the following:

| Time in days for the new born animal to double its weight: | | 100 parts of milk contain | | | |
|---|---|---|---|---|---|
| | | Protein | Ash | Calcium | Prosphorus |
| Man | 180 days | 1.6 | 0.2 | .021 | .022 |
| Horse | 60 days | 2.0 | 0.4 | .086 | .057 |
| Cow | 47 days | 3.5 | 0.7 | .114 | .087 |
| Sheep | 15 days | 4.8 | 0.84 | .178 | .127 |
| Goat | 22 days | 3.7 | 0.78 | .143 | .122 |
| Swine | 14 days | 5.2 | 0.80 | .178 | .135 |
| Cat | 9.5 days | 7.0 | 0.02 | .... | .... |
| Dog | 9 days | 7.4 | 1.33 | .321 | .233 |
| Rabbit | 6 days | 10.4 | 2.50 | .636 | .437 |

A baby chick doubles its weight in about six days, so it requires several times as much lime, protein, ash and phosphorus as the the average food contains. The same is true in the manufacture of eggs. You can overcome this deficiency to a great extent by preparing and using the following:

| | |
|---|---|
| Baking Soda | 2 level teaspoons |
| Calcium Phosphate | 2 ozs. |
| Calcium Carbonate | 8 ozs. |
| O. P. Oil Meal | 2 lbs. |
| Ground Oyster Shell | 4 lbs. |
| Table Salt | 8 lbs. |

See that the above are thoroughly ground and well mixed. Mix about eight tablespoonfuls to each half bushel of the dry mash by measure, or eight tablespoonfuls to each 15 pounds of dry mash by weight. Keep this in all dry mash and also in all the moistened mash fed the fowls. We feel sure it will increase the egg yield and improve the shell. You can buy some of these ingredients from your local druggist. Some fear that the proportion of salt is excessive. This is not the case. Eight tablespoonfuls of the egg and shell maker mixed with 15 pounds of dry mash does not make it too strong with salt.

## THE PURPOSE OF THE DRY MASH

The purpose of the dry mash is to act as a balance to the entire feeding system. Being ground, the food is that much more quickly digested by the hen and she is saved the trouble of grinding it in her gizzard. Being rich and concentrated, it is not only a chief reliance for egg production, but it is also a source of danger if overdone.

Dr. Pearl at the Maine Station uses this balance-wheel so very carefully that the ingredients are varied every few weeks, from early autumn on until spring, being much richer toward the end of winter than they dare make them when the birds are first shut in for winter forcing for eggs.

## VALUE OF GROUND FEEDS

Many poultrymen, especially farmers, make the mistake of feeding their poultry entirely on whole grains. By feeding ground feeds, you aid the hen that much toward digestion. It is a great tax on the digestive system and too much of the energy of the fowl is spent in grinding the food and it takes just that much from egg production. We have found that one of the best methods of supplying ground food is by the use of ground oats in a hopper, or else a mixture of equal parts of corn meal, wheat, bran and shorts.

Wheeler, of the New York Experiment Station, has the following to say on this subject:

When laying, a 3 to 5-pound hen requires daily for every hundred pounds of live weight, or in other words, 20 to 25 birds:

5.5 pounds of dry matter
0.3 of a pound of ash.
1.0 pound protein
3.75 pounds carbohydrates
0.35 pound fat

Wheat, which is considered one of the best poultry foods, possesses:

5.5 pounds of dry matter
0.9 of a pound of ash
0.62 of a pound of protein
4.25 pounds carbohydrates
0.1 of a pound of fat

About three-quarters of the ration is used in supplying the food nutrients necessary for maintaining the body; the other fourth is given over to the production of eggs.

If the hen eats four ounces of wheat a day and one-quarter is used in the production of eggs, what would be the result? One ounce of wheat has one-tenth of an ounce of protein. An egg contains one-fourth of an ounce of protein, so the hen would have enough protein for an egg every two and one-half days. Figuring the same on ash, it would have enough to produce an egg every twelve days. It would have an excess of the other food requirements. This shows that it is economy to feed a grain ration or a combination of grain and ground feeds, because they alone are not of a nature to furnish the needs of the hen. Other grains, such as corn, would show a greater difference.

## OBJECTIONABLE FOODS

Some foods are objectionable for various reasons and it is necessary to use some judgment in the selection of foods.

Onions are a very healthy food for poultry. Fed in moderation, there is no objection to them. But if they are fed too liberally they carry their flavor to the egg.

Cotton-seed meal is a dangerous food to use in your dry mash. We recommend that you refrain from its use.

Rape is a rapid growing plant and makes an abundant growth of green food. It is about equal to cabbage in feeding value. We have known of cases where the eggs were made an objectionable greenish color by feeding too much rape. We advise the use of rape, but if you notice any bad effects from its use you can limit the quantity fed so that the results will not be unsatisfactory.

Manure piles are not the right sort of food for a hen to live on to produce a high quality and highly flavored egg. It is true that hens which have free range and run to manure piles and drink from puddles of water in horse tracks around manure piles keep in good health and appear husky, yet at the same time the eggs made from such food and drink are more or less tainted, and the yolk has almost a blood red color, and the flavor of the eggs is far from the best.

In sections where crops are laid waste by Army Worms, the hens are often allowed to eat the worms. In such cases, if the hens have access to any considerable number, the contents of the eggs will be greenish in color. We made that test this year.

Dried blood is often in poor condition for food and is often tainted, when fed to poultry. We once killed a valuable lot of hens by the use of dried blood which was sold as a poultry food. When such foods are used it is advisable to require the dealer to guarantee the quality of the article purchased.

Tainted, moldy and unwholesome foods of all kinds should not be used if you expect the best results. Spoiled grain, putrid meats, and other spoiled or fermented foods often poison the fowls. Salt meat or brine from meat, ice cream freezers, salt fish and similar foods and drinks are fatal to poultry if partaken of too freely. We avoid mold at all times.

Poor quality grains, that is, grains which are light in weight and are practically all hull, or grains which are moldy, should not be used. There is no objection to wheat screenings and waste grain, providing they have any food value and are wholesome. In fact, many farmers raise their poultry and produce eggs on the waste products about the farm. Corn meal and corn chop heat very easily in hot weather in some climates, and this heating and sweating often render these feeds unfit for food. Poultry does not like rye and it does not seem to agree with them.

### SLOPPY FOODS

Diarrhoea often results from the use of sloppy foods. Moistened mashes are good and should be used, but it is better never to make the mixture so wet that it will be very sloppy. If the food is thoroughly moistened throughout, that is sufficient. We are too often inclined to overdo a good thing.

### REFUSE

We often have inquiries as to whether refuse from hotels, cafes, etc., should be used for poultry. The scraps of meat, bread, cooked vegetables and such foods are excellent for poultry, but if these have all been mixed with the slop, dish water, moldy and decayed foods and the whole mixture held for a considerable length of time, it would be a dangerous thing to give poultry. Foods must be wholesome if you expect the best results. If the refuse meets these requirements, then it can be used. It is not a bad idea to mix bran with it before feeding.

### STARVATION RATION FOR HENS

A poultryman may keep an abundance of feed before his poultry and yet starve them as far as proper production and growth is concerned. This can be done in at least five different ways.

1. Lack of grit will prevent the hens from grinding their feed so that it may be digested and assimilated.
2. If a ration is composed entirely of dry mash, hens cannot consume enough of this dry ground feed to maintain their bodies and still have a surplus for growth or eggs.
3. A ration may contain too much fibre or waste feeds, which will make it impossible for the hens to consume enough of this ration to properly nourish herself, and the extra amount of fibre often overtaxes the digestive system.
4. A ration may lack enough of certain kinds of feeds which help to digest or assimilate other feeds. These feeds are called helpers. The ration may also be lacking in what is known as vitamines, or protective feeds. These are necessary for growth and development.
5. An improperly balanced ration, or one that is one-sided and which contains too much of one kind of feed and not enough of another.

The slowness of growth and development in young chicks or the dropping off of production in hens is one of the first indications of poor feeding, and often an investigation may show that one of the above mentioned things is at fault.

### WATER AS IMPORTANT AS FEED

One of the most essential things, and one which is often neglected, is to supply your flock with water. If the drinking pan is dry or frozen up, your egg-yield is certain to drop. The egg is composed largely of water, as is the hen's body, so while water is one of the cheapest things, yet it is one of the most essential. By cutting down the water supply you can decrease your egg yield 50 per cent in two days' time. Give this question your careful attention and try to make some arrangement whereby your water fountain can be kept from freezing this winter. The Norwich Poultry Supply Company of Norwich, Conn., makes a good anti-freezing fountain.

Plenty of water for poultry of all ages is an absolutely necessary requisite. Practically all foods contain more or less water, but, in addition to that, the fowls must have plenty of clean, pure water available at all times. A dozen fresh eggs contain about one pound of water. The hen must have water if she is expected to manufacture eggs. If you let the drinking pan go dry even for a half day, you will see a big drop in the egg yield. This is a serious loss on a large farm where there are a large number of laying hens kept for profit. So don't allow the water to freeze in winter and remain frozen for the entire day. Don't let the drinking pan go dry, winter or summer. It will cost you dollars if you do.

In order to determine the factor that water plays in egg production, a number of experiments were made at the Missouri Poultry Experiment Station.

A number of pens which had been furnished water at all times were given water only once each day, all they would drink, then the water removed. The results were that the egg yield was reduced 50 per cent. This reduction was the same in the different varieties.

A pen of sixty White Leghorns, composed of old and young, consumed 2½ gallons of water daily during the warm weather. This would indicate that the average farm flock of 100 to 120 birds should be furnished at least 5 gallons of water per day. Laying hens frequently consume 8 ounces of water daily. This means one gallon daily to 16 hens.

From the hen's viewpoint, water is worth just as much as feed, for she can't make an egg with either one alone. Therefore, the man who furnishes high-priced feed, but neglects the water supply, is making a great mistake and will have to be content with a limited egg yield.

At present prices and weather conditions, hens consume about 6 gallons of water to each $1.00 worth of feed. Therefore, if the feed is worth $1.00 to the hen, the water is also worth $1.00.

The value of water to the hen is shown by the many uses to which it is placed.

First, water is used to soften the food and make it ready for digestion.

Second, water in the form of blood acts as a common carrier and carries the nourishing parts of the food from the digestive organs to the tissues where needed, and carries worn-out or exhausted tissues to the different organs to be eliminated from the body.

Third, water is an important factor in egg production, as it enters into the composition of the egg as well as the hen's body, the egg being about 68 per cent water, or approximately one pound.

Fourth, water is important in equalizing the temperature of the hen's body, which is done in two ways. First, cold water lowers the body temperature, while warm water holds the temperature high. For this reason, we give hens cold water in summer and warm water in winter. The second method of cooling is by evaporation, which is a cooling process. The temperature of the human system is reduced by the evaporation of sweat from the surface of the body, but with the fowl the evaporation takes place principally through the breathing organs, which accounts for the hen holding her mouth open and breathing rapidly on a hot day.

Observation of experiments conducted at this Station lead us to believe that the first three uses of water are very much the same at all times and that the wide range in the consumption of water is influenced by conditions of the weather.

The two lessons which stand out prominently as a result of experiments are:

First, water is just as important as feed.

Second, once or twice each day is not often enough to supply the water. Keep it before them at all times.

The best physicians are now asserting that water is food. In a series of lessons recently sent out by one such physician, appears the following: "Proteids and water are the two classes of foods which are absolutely necessary. Man can, and men have lived indefinitely on these two classes. This cannot be said of any of the others. Mineral matter is also essential, but this is sure to be taken with water and proteids. These three foods are the building materials of the body, they repair waste and create new tissue."

In Bulletin 28, revised edition, "American Food Materials," we find the results of sixty different analyses of uncooked eggs and 19 analyses of boiled eggs, giving the maximum, the minimum, and the average contents. The average possessed above 68 to 70 per cent of water. Where shall the hen get the water to put into that egg? Almost three-quarters of it is to be water. If it is absorbed from the body tissues, the result will be that the hen will become very thirsty and will demand much water. But suppose that you do not furnish plenty of water, or that it is so icy that the bird cannot drink much, what is likely to happen? Can a bird make you a product that is over 70 per cent water, without water? How long can she draw on her body juices or depend on the water in the mash? Water is one of the most essential and cheapest of foods, and yet it is too often neglected.

## QUESTIONS ON FEEDING

## LESSON 12

1. Why is it important for the poultryman to have a thorough knowledge of the subject of feeds and feeding?
2. What are the eight most important elements found in both plants and poultry?
3. Why do hens need some kind of meat or animal food?
4. What is meant by the term "Nutritive Ratio?" Give an example.
5. What is a "Feeding Standard," and what is the feeding standard for laying hens?
6. What do you understand by the term "Balanced Ration," and what single grain comes nearest to being a balanced ration for laying hens?
7. What is meant by (a) wide ration? (b) Narrow ration?
8. In compounding a ration, name three essentials which should be borne in mind, in addition to the fact that it must be "balanced."
9. What are the five classes into which poultry feeds are divided?
10. What is the value of green feed in poultry feeding, and how can it be provided easiest in winter?

## THE PROCESS OF DIGESTION

In order to feed our poultry intelligently we should be familiar with the digestive apparatus of a chicken, and with the processes of digestion and assimilation. We should know how the food is transformed into flesh and eggs, heat and energy.

The digestive apparatus of the fowl is entirely different from that of any other form of animal life, the chief mechanical difference being that the fowls have no teeth, so that their food is "chewed" after having been taken into the body.

The organs of digestion, and the process which takes place in each organ are, briefly, as follows:

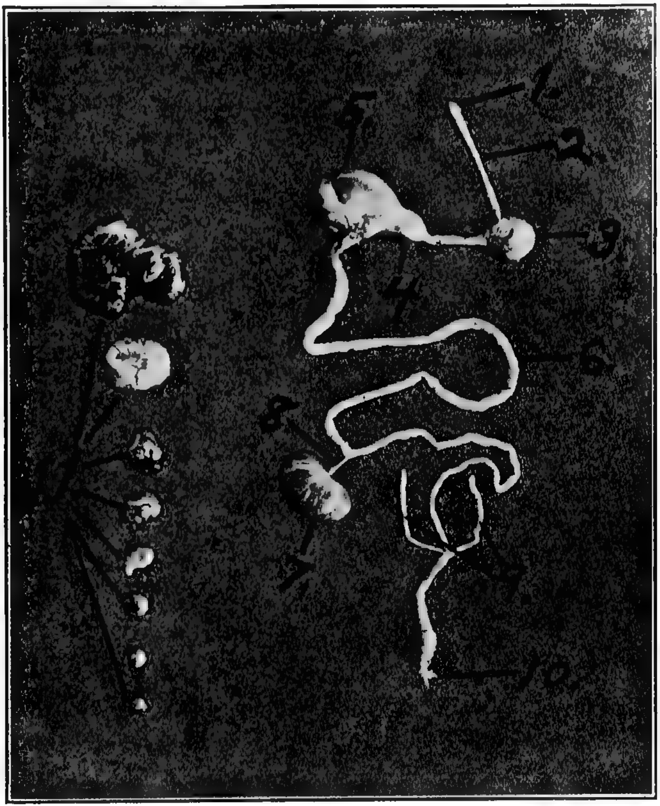
1. **The Beak** or mouth. The hard horny portion of the head, used for breaking, tearing, pulling, or picking up food. Less saliva is secreted in the mouth of a chicken than in the mouths of other animals, the amount being just sufficient to coat the food particles and enable them to pass easily through the (2) esophagus, (gullet) into

3. **The Crop** (craw). The crop is an elastic pouch or sac lying in front, and at the base of the neck. The crop serves two purposes. The first is a storage place for the food. Enough food can be placed in the crop at one time to keep the rest of the digestive organs busy from eight to twelve hours. The second function of the crop is to soften the food so that it can be more easily handled by the organs further on. From the crop the food passes into

4. **The Stomach,** the enlargement just in front of the gizzard, where it is mixed with gastric juices, and from whence it passes immediately into

5. **The Gizzard.** The gizzard is perhaps the most important of the digestive organs of a fowl. It is a tough muscular organ in which the food is ground to a pulp and further mixed with digestive juices. In order that the gizzard may properly perform its functions, it is necessary that the birds have access to grit, i. e., small rough particles of gravel and stone, which, when taken into the gizzard, do the actual work of grinding the food. After the food has been reduced to a pulp in the gizzard, it passes into

6. **The Intestines,** where the last stages of digestion taks place. The last stages of digestion are, in realtiy, not digestion at all, but assimilation. By "assimilation" we mean the process by which the digested food nutrients are separated from the undigested (and indigestible) portion of the food, and absorbed into the system. The way in which this is accomplished is as follows: As the food comes from the gizzard, it is mixed with **pancreatic juices** from the pancreas, and bile from the liver. These juices, working together, break up the vegetable fats and oils, converting them into soluble animal fat. They also work on the starch and protein rendering them all more soluable. Passing on through the intestines, the food constituents are absorbed by minute



The digestive tract of a chick which shows the course the food takes in the process of digestion. No. 1 is the tongue. No. 2 is the esophagus. No. 3, crop. No. 4, stomach. No. 5, gizzard. No. 6, intestines.

projections which cover the inner walls of the intestines, called **Villi.** From the villi the assimilated food is gathered into ducts passing through the liver and spleen, where it is purified and either changed into blood or mixed with the blood, and then passes to the various parts of the body where it is needed.

## THE PRACTICE OF POULTRY FEEDING

From what has already been said, the reader should not get the impression that the study of nutritive ratios and the compounding of balanced rations constitutes the most important part of the subject of feeding, for such is not the case. While a thorough understanding of these features of the feeding problem is of the utmost importance, yet it is absolutely essential that we know how to apply this knowledge after we have once secured it. Knowledge along any line is only valuable to the extent that it is put into successful practice.

Again, we must be well acquainted with the body needs of the various ages and types of fowls which we are feeding. Both the physical properties of the ration, as well as its digestible nutrients, must be adapted to meet the special requirements of the birds to which it is to be fed. For instance, if a ration is for a laying hen it should provide them with food of such quantity and quality that her digestive system can dispose of it with the least effort, yet giving to her body sufficient nourishment to keep it in a healthy physical condition and at the same time giving a surplus of food in a form which the fowl will dispose of in eggs rather than in surplus body fat.

The manner of feeding is also of vital importance. It is not at all uncommon to find two poultrymen feeding the same rations under similar conditions, and yet producing unsatisfactory results in one case, while fulfilling every requirement in the other. Thus, the necessity of knowing **how** to feed as well as **what** to feed becomes very evident. This will be discussed in full later.

## FEEDING FOR EGG PRODUCTION

**Composition of Hens and Eggs.** As suggested above, the first thing to do in solving any feeding problem is to thoroughly understand the special requirements which are to be met. In taking up the problem of feeding for egg production, then, we should know the composition of the hens, whose bodily health we must conserve, and of the eggs which we wish them to produce in large numbers. That is, we must know the relative proportion of the protein and carbohydrates in the body of a hen and in an egg. With this knowledge in mind, we can proceed to compound a ration which will supply these food nutrients in their proper form and proportion.

## THE COMPOSITION OF THE FOWL'S BODY

**Water.** More than one-half of the gross weight of the mature hen is water.

**Ash.** That which is left of the hen's body after having been subjected to great heat is termed ash or mineral matter and constitutes about 4 per cent of the entire weight of the body.

**Protein** is the most important element that enters into the composition of the hen's body, it being the base of all living tissues and constituting about 21 per cent of the same.

**Fat** is stored up materials in the hen's body, to be drawn upon to supply the requirements of the body in the event of insufficient materials being present in the fowl's feeds. Under normal conditions about 17 per cent of the fowl's body is fat, although the body of the fattened fowl contains more than 30 per cent fat.

**Composition of the Egg.** Egg yolk—water, 53 per cent; protein, 16 per cent; fat, 30 per cent. Egg white—Water, 84.80 per cent; protein, 11.45 per cent; fat 2 per cent; carbohydrates, .55 per cent. Eight per cent of the whole egg is shell, consisting largely of carbonate of lime.

A fresh egg contains 68 per cent water, 12 per cent ash, 11 per cent protein and 9 per cent fat. If we now multiply the percentage of fat in both instances by two and one-fourth, so as to reduce the fat to its equivalent in carbohydrates (starch), and then divide the products thus obtained by the respective percentages of protein in the body of a hen and in an egg, we find that there is approximately one part of protein to two parts of carbohydrates. In other words, the nutritive ratio of the body of a hen, and of an egg is as 1 to 2 (one part protein to two parts carbohydrates and fat). Thus we see that in compounding a ration for egg production, we must make it rich in protein, i. e., a narrow ration, about 1:5 or 1:6.

## RELATION OF FEED TO EGG PRODUCTION

From records compiled in the National Egg Laying Contests at the Missouri State Experiment Station, of which I had charge, it was found that the average hen weighs five pounds, consumes seventy-five pounds of feed, and produces one hundred and fifty eggs per year.

The indications are that she uses three-fourths of the feed to supply her body and one-fourth to make eggs, and from each one-fourth pound of feed above maintenance she makes two eggs which weigh one-fourth pound, thus producing a pound of eggs for each pound of feed above maintenance, taking the year as a basis for averages.

The hens had feed before them at all times, and as the average hen consumes seventy-five pounds of feed, which is twelve hundred ounces, it will be seen that the hen's digestive capacity is one hundred ounces per month, that she averaged using seventy-five ounces for her body, and that from the other twenty-five ounces she made twelve and one-half eggs, which weighed twenty-five ounces.

Although we believe the hen's digestive capacity is about the same at all times, yet she does not produce the same number of eggs each month, which is accounted for by the proportion of feed required for her body at different times. If the weather is pleasant and other conditions right, the hen may use only fifty ounces for her body and make twenty-five eggs from the other fifty ounces of feed, but if the weather turns cold and her house is not what it should be, so that ninety ounces of feed is needed for her body, she can make only five eggs from the other ten ounces, and if the weather changes suddenly, so that one hundred and ten ounces of feed is needed to support her body, she can and does arrest the eggs which are partly developed, turn the egg material back into her own system and use it as food, which explains why hens stop laying on short notice after a sudden change in the weather.

These averages were obtained by using a large enough number of hens that the individuality of a single hen is destroyed, which makes the average more accurate. It must be remembered that while some hens have a digestive capacity of only eighty ounces per month, others have a capacity of one hundred and twenty ounces, yet the same rules governing maintenance and egg production apply.

The next question naturally is, "What can we do to lessen the quantity of feed necessary for the hen's body, in order that a larger part of the feed may be used for eggs?" Where hens roost out during the winter, with no protection from the storms, they cannot digest any more food than is necessary to support their bodies. Therefore, comfortable houses economize food and make it possible for the hens to produce eggs in winter.

## FUEL FOR THE FACTORY

When you heat your home you throw coal and fuel into the furnace. A combustion of the fuel takes place while it is being burned and gives off great quantities of heat, together with carbon dioxide and other gases, which pass up the chimney. That which remains is considerable amount of ash and other mineral materials. The same process takes place within the hen's body and, therefore, we must see that the hen is scientifically fed. The same elements that are put into the furnace as fuel are present in the hen's feed, and the same heat, energy and by-products are liberated through the hen's body by the process of digestion.

The heat produced depends entirely upon the amount and quality of the feed given and is in direct proportion to same. The feed is digested and assimilated by the blood and is burned in the body, which causes heat to generate and the body is thus kept warm. We find that carbon-dioxide is given off in large quantities through the process of respiration, the same as it is carried from the furnace by the chimney. Feed is first drawn upon to maintain the fowl's body, and after that the remainder goes to produce fat, flesh and eggs. If the bird does not produce eggs, the reserve is stored up in the body as fat.

In feeding your hen, look upon her very much as the manufacturer looks upon his factory and its products. He does not expect to draw from his factory finished products if he does not supply the raw material from which to manufacture same. On the other hand, he expects to put into the factory certain kinds and amounts of raw material, and expects to realize therefrom the finished product in direct proportion to the amount and quality of raw material used in its production. He does not expect more than he puts in. Neither can a poultryman expect to produce eggs, growth or fat if he does not supply the fowls with the necessary feeds of the right kind and mixed in the right proportions.

Another very important point is the balancing of the feed ration so that the digestive system is not required to do unnecessary work. To illustrate: If a hen is fed one hundred ounces of feed per month, only 60 per cent of which is properly balanced, the hen will appear healthy and hungry, yet produce no eggs, for it will be seen that her digestive system is burdened with the 40 per cent of the feed which cannot be used.

The condition of the feed, time and regularity of feeding, water supply, etc., are all important points to be considered.

One of the first points to be considered in breeding for egg production is to get a good digestive system for powerful egg organs, for a weak digestive system will never make a high egg producer.

## CONSIDER COST OF FEED STUFFS

**The Cost Item in Compounding Rations for Egg Production.** An ideal ration is one compounded by bringing together the kinds of feed that furnish the proper proportion of the different nutrients in such combinations of materials as will supply the necessary bulk—**at the least cost.** More than one poultry plant has failed, not because the hens were not fed balanced rations, but because the rations were composed of food stuffs so expensive as to entirely absorb the margin of profit. In every such case a more simple ration, costing considerably less, would have fulfilled the requirements just as well.

In order to balance the ration, it is always necessary to use some concentrated food (some food very rich in protein), in order to make the ration narrow enough. It will be readily seen, then that the value of these foods, and their cost, must be viewed from the standpoint of the proportion of their **protein content.** The following table taken from California Experiment Station Bulletin No. 164, shows the relative cost of protein per pound as furnished by the various concentrated foods. To facilitate comparison, similar data are also given in the table for some of the grains and other food stuffs. The prices, of course, should always, if possible, average market values. Local prices, of course, should always be used in determining the cheapest protein foods to buy. The table merely serves to indicate how the careful purchaser may be able to compare food values at any season of the year.

In considering this table, please bear in mind that the prices of many of these feeds have doubled in price, then also double the price of the protein per pound where that is true, or make a relative increase in the cost of the protein in proportion to the increased cost of your feed. Also, bear in mind that protein in some foods is not as digestible as in some other foods, and therefore, the cheapest is not always the best.

## TABLE 1.—COST OF PROTEIN IN VARIOUS FOODS AS GOVERNED BY COST OF THE FOOD AND ITS CONTENT OF DIGESTIBLE PROTEIN

| Kind of Food | Price per ton (Dollars) | Protein Pounds per ton | Protein Price per lb. (Cents) |
|---|---|---|---|
| Skim milk | 4 | 66 | 6.0 |
| Granulated milk | 80 | 1000 | 8.0 |
| Dried casein | 80 | 1500 | 5.3 |
| Fresh meat | 60 | 400 | 15.0 |
| Meat scraps | 60 | 1080 | 5.6 |
| Dried blood | 60 | 1440 | 4.2 |
| Alfalfa meal | 30 | 274 | 10.9 |
| Alfalfa hay | 18 | 274 | 6.6 |
| Linseed oil cake meal | 46 | 522 | 8.8 |
| Cocoanut oil cake meal | 30 | 328 | 9.1 |
| Soy bean meal | 45 | 600 | 7.5 |
| Cotton-seed meal | 46 | 822 | 5.6 |
| Beans | 60 | 348 | 17.2 |
| Corn | 36 | 156 | 23.1 |
| Rice | 36 | 106 | 34.0 |
| Rice bran | 30 | 214 | 14.0 |
| Peas | 20 | 380 | 21.0 |
| Oats | 40 | 184 | 21.7 |
| Brewer's grain, wet | 10 | 78 | 13.0 |
| Barley | 30 | 192 | 15.6 |
| Rye | 30 | 198 | 15.2 |
| Wheat, plump | 36 | 184 | 20.0 |
| Wheat, shrunken | 31 | 264 | 11.7 |
| Wheat shorts | 35 | 244 | 14.3 |
| Wheat bran | 32 | 224 | 14.3 |
| Mixed feed | 34 | 192 | 17.7 |
| Broken crackers | 26 | 190 | 13.7 |

## COMPOUNDING THE RATION

**Compounding the Ration.** In compounding the ration the aim should be to make it as simple and as cheap as possible and still fulfill the requirements. This has been the thought uppermost in mind in the experiments carried on by the American Poultry School, and in feeding the hens in the American Egg Laying Contests. It has been interesting to note the results of the various feeding tests, and especially pleasing that the more simple and cheaper rations have, in practically every case, given the most satisfactory results.

## WHAT FEED DO HENS LIKE BEST?

In compounding our rations to meet the needs of our poultry, it is both interesting and valuable to note which feeds the hens themselves will select if allowed to take their choice. In order to obtain this information the following experiment was conducted:

A pen of twelve hens, composed of six S. C. White Leghorns and six Buff Orpingtons, was placed in a house and yard at the Missouri State Poultry Experiment Station at Mountain Grove on the first day of November. Thirty different kinds of the most staple foods obtainable were placed before them in open hoppers, where they might take their choice and help themselves. The result of the test covering a period to twelve months was as follows:

GRAINS

| lbs. | Grain |
|---|---|
| 144 lbs. | wheat |
| 107 lbs. | corn |
| 84 lbs. | millet |
| 45 lbs. | sunflower seed |
| 71 lbs. | kaffir corn |
| 29 lbs. | hulled oats |
| 30 lbs. | whole oats |
| 17 lbs. | cane seed |
| 8 lbs. | buckwheat |
| 5 lbs. | cow peas |
| 4 lbs. | rye. |
| 4 lbs. | barley |
| 2 lbs. | rice |

MEAT FOODS
549 lbs. buttermilk
2 lbs. dry beef scraps
2 lbs. fish scraps
MILL PRODUCTS
35 lbs. rolled oats
22 lbs. ground oats
14 lbs. corn meal
13 lbs. shorts or middlings
6 lbs. gluten meal
6 lbs. bran
2 lbs. flour
1 lb. O. P. oil meal
GRIT
20 lbs. oyster shell
5 lbs. grit
2 lbs. charcoal
2 lbs. hard coal ashes
GREEN FOOD
1 lb. alfalfa meal

Water....................509 pounds

### SUMMARY OF RATIONS

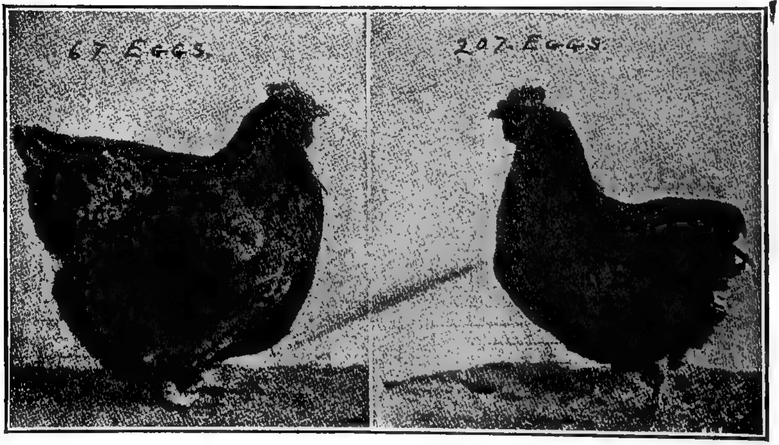
982 lbs. feed consumed
1058 lbs. water and milk
177 lbs. of eggs laid
1407 eggs laid during test

It will be seen from the above that these hens ate more wheat than any other one food. They ate principally wheat, corn, millet, sunflower seed, kaffir corn and oats. They ate four times as much ground and rolled oats as they did corn meal. They consumed but very little bran. They used four times as much oyster shell as grit. In animal or meat food they ate less than two pounds each of meat scraps and fish scraps, while they drank 549 pounds of buttermilk. They were out of buttermilk practically a month during this time, and this accounts for the fact that they did not drink more buttermilk. When they had both before them, and could take their choice, they drank a little more buttermilk than water.

If this test indicates anything, it indicates that sour milk or buttermilk is a better meat food than beef scraps or fish scraps. They ate practically alfalfa meal, in spite of the fact that they were kept in a bare yard and were given but little other green feed. Our poultry will not eat alfalfa meal or shredded alfalfa even when scalded, unless forced to do so by mixing it with other ground feeds. Out of practically every eleven pounds of milk, water and feed consumed these hens manufactured one pound of eggs. The last three months of the year these hens ate no ground food at all, but ate grains exclusively.

### THE AMOUNT OF FOOD REQUIRED BY A HEN

It will be seen from the above experiment that each fowl consumed 81



Two Black Orpingtons of two different strains. One of the beef type, as you can see, the other of the egg type. No amount or kind of feed would have made the one which laid 67 eggs lay many more than she did. The feed must not be blamed in all cases for hens not laying. If the hens are bred right and you use the feeds as recommended in this book, you are certain to get entirely satisfactory results.

pounds of feed and 88 pounds of water and buttermilk during the year. Other experiment stations report as low as 60 pounds of feed a year for the average hen. In order to make a further test of what foods the hens like best and to further test the amount of food required by certain hens, we made a six months' test with two S. C. Brown Leghorns, two White Wyandottes, two S. C. Reds, two White Orpingtons, two Barred Plymouth Rocks, and two Light Brahmas. These pullets were not quite fully developed when put on the test, but began to lay in about two weeks. Each pullet was put in a separate pen and no other bird allowed to have access to any of the feed. The feed was all kept in open hoppers so the birds could take their choice. Buttermilk was used only for a short time and was discontinued because of its poor quality. When available the fowls drank about equal quantities of milk and water. The following table shows the results of the six months' individual test:

| Variety | Brown Leghorn | Brown Leghorn | White Wyandotte | White Wyandotte | S. C. R. I. Red | S. C. R. I. Red | White Orpington | White Orpington | Barred Ply. Rock | Barred Ply. Rock | Light Brahma | Light Brahma | Total ounces | Total pounds |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Band number | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | ..... | .... |
| Wheat | 139 | 153 | 134 | 86 | 93 | 165 | 254 | 211 | 276 | 225 | 270 | 248 | 2254 | 141 |
| Whole corn | 53 | 14 | 141 | 160 | 8 | 103 | 16 | 24 | 26 | 104 | 138 | 72 | 859 | 53 |
| Corn chop | 109 | 71 | 67 | 184 | 20 | 85 | 169 | 134 | 98 | 118 | 191 | 83 | 1329 | 83 |
| Kaffir corn | 100 | 34 | 141 | 41 | 90 | 49 | 94 | 232 | 211 | 86 | 106 | 182 | 1366 | 85 |
| Oats | 86 | 103 | 49 | 48 | 98 | 94 | 111 | 80 | 89 | 89 | 103 | 76 | 1026 | 64 |
| Millet | 13 | 119 | 123 | 128 | 159 | 134 | 166 | 159 | 136 | 39 | 12 | 138 | 1326 | 83 |
| Sunflower seed | 2 | 5 | 24 | 1 | 6 | 2 | 9 | 2 | 1 | 16 | 5 | 7 | 80 | 5 |
| Bran | 58 | 39 | 49 | 97 | 86 | 160 | 60 | 104 | 74 | 117 | 110 | 64 | 1018 | 63 |
| Rolled oats | 75 | 81 | 33 | 31 | 40 | 74 | 50 | 50 | 49 | 34 | 68 | 82 | 657 | 41 |
| Ground Oats | 106 | 118 | 73 | 53 | 104 | 147 | 168 | 191 | 66 | 90 | 101 | 118 | 1335 | 83 |
| Corn meal | 96 | 65 | 41 | 99 | 36 | 110 | 24 | 96 | 17 | 19 | 101 | 27 | 731 | 45 |
| Middlings | 59 | 30 | 23 | 19 | 28 | 21 | 8 | 31 | 17 | 19 | 28 | 22 | 305 | 19 |
| Alfalfa meal | 32 | 18 | 17 | 17 | 6 | 13 | 3 | 13 | 3 | 12 | 8 | 12 | 154 | 10 |
| Beef scraps | 31 | 19 | 19 | 11 | 11 | 15 | 11 | 13 | 25 | 37 | 43 | 27 | 262 | 16 |
| Oyster shell | 36 | 41 | 23 | 20 | 16 | 24 | 27 | 18 | 17 | 23 | 27 | 31 | 303 | 19 |
| Grit | 39 | 29 | 31 | 28 | 23 | 27 | 20 | 23 | 16 | 24 | 24 | 24 | 308 | 19 |
| Charcoal | 13 | 0 | 10 | 1 | 3 | 3 | 1 | 3 | 5 | 6 | 3 | 5 | 53 | 3 |
| Total food | 1047 | 939 | 998 | 1024 | 827 | 1226 | 1191 | 1384 | 1126 | 1058 | 1328 | 1208 | 1366 | 835 |
| Water | 809 | 1023 | 575 | 628 | 1176 | 969 | 747 | 811 | 1079 | 794 | 1121 | 853 | 10585 | 661 |
| Milk | 312 | 248 | 31 | 58 | 103 | 384 | 191 | 212 | 146 | 210 | 357 | 210 | 2462 | 154 |
| Total drink | 1121 | 1271 | 606 | 686 | 1279 | 1353 | 938 | 1023 | 1225 | 1004 | 1478 | 1063 | 13047 | 815 |
| Number of eggs | 87 | 101 | 15 | 36 | 38 | 98 | 69 | 57 | 115 | 107 | 52 | 79 | ..... | .... |
| Weight of pullet | 4½ | 3½ | 4 | 4 | 5½ | 5½ | 5 | 6 | 5½ | 5½ | 9¼ | 9½ | ..... | .... |

The above shows that hens vary greatly in likes and dislikes. There was a difference of over 500 ounces, or more than 20 pounds between the least amount eaten by a pullet and the greatest amount eaten by any bird in the six months' test. Most all the birds ate more wheat than most anything else. On the average they ate almost twice as much wheat as any other one food. They ate a total of 515 pounds of grain, and 38 pounds of mineral matter. They drank 835 pounds of water and milk. They ate just a few pounds more feed than they drank water. They ate a total of nearly 70 pounds of feed each in six months. They were given no green food or moistened mash.

These pullets gained a pound each in the six months. Each one ate, on the average, more than twice its weight in feed, drank more than twice its weight in water and buttermilk each month. You can see the enormous amount of feed that each pullet consumed and converted into the finished product each month, more than four times its body weight in water, milk and feed. At the same rate a 150-pound man would have to eat and drink 600 pounds per month and a 1,200-pound horse would have to eat and drink 4,800 pounds of feed and water per month.

From all the tests and experiments which we have made we find that wheat, corn and oats, in both whole and ground form, constitute the bulk of the food. Outside of a little green meat and mineral food, these are about all they need, and it is not necessary for hens to have the great complicated mixtures which we too often see advocated. It seems that the hens prefer cracked corn or corn chops more than whole corn or corn meal. They prefer ground oats to oats in any other form. These are the plain whole oats, hull and all, run through an ordinary feed mill. If fed at all, millet should be fed sparingly.

## FEEDING A FOURFOLD PROBLEM

We agree with Prof. Lewis when he says:

"The American hen is one of the most efficient manufacturing plants in existence. She is nothing more nor less than a machine, a very delicate yet a very efficient machine, which is so designed and highly developed through breeding and care that she can transform raw material or fuel, in the form of grains and their by-products, into one of our most relished and widely used breakfast foods. What is of special significance is the fact that she can bring about the transformation in a way to leave a handsome margin of profit to her owner.

"There is no more efficient transformer of raw material into a finished product for human consumption on the farm today than the hen. She is in a class by herself, the pride of her owner, and worthy of envy by the other inhabitants of the farmyard. She consumes upward of twenty times her own body weight in fuel within a year's time, and from this produces eggs equal to ten times her own body weight. Truly a remarkable performance. The feed which we give our flocks must not only supply the fuel to keep the egg factory running smoothly but it must also provide in suitable form the raw materials from which eggs and poultry flesh can be manufactured.

"The feeding problem is most vital to the successful management of the poultry flock. Feeding costs represent about one-half the cost of producing a dozen eggs. A great saving in the cost of production and a corresponding increase in profits can be secured through the application of business principles in handling this problem. It is a fourfold problem including the selection of the proper ingredients for the rations, the purchase of them at fair prices, the mixing of proper rations, and the practice of proper methods of feeding. Every feeder of poultry should study these problems carefully.

"A bird's digestive system is so built that it cannot use fiber to advantage. Often flocks with plenty of mash before them will be literally starved, due to the high fiber content in the mash, from which they cannot get a sufficient amount of digestible food material. Look out for these 'starvation' mashes. In the last analysis the problem of home mixing vs. ready-mixed goods must be determined on the merits of each case, the determination being made on the basis of price and quality of the goods.

"A grain mixture should never have a fiber content above five per cent, and a mash mixture should never have more than eight per cent of fiber for the best results.

"Price is an important consideration, but should never be considered as having equal or greater value than quality or proper balance of ingredients.

"Recent feeding tests at the New Jersey Agricultural Experiment Station and at the Vineland contest have developed very interesting results regarding the proper proportion of mash and grain to feed. It had been formerly suggested and practiced that two parts of grain to one of mash was the best proportion. The best results have recently been obtained where the birds were compelled to eat equal parts of mash and grain during the winter and spring. During late spring, summer and early fall the grain should be materially reduced, thus compelling the flock to consume greatly increased amounts of mash. Mash contains more protein, which is the egg-making material; hence its greater use tends to force greater production. The following table has been worked out to show the proper amounts of grain to feed layers during each month in order that the proper proportion of mash and grain consumption can be assured:

### Amount of Grain to Feed Layers Each Month in the Year

| MONTH | Pounds per Day per 100 Birds | Pounds for each feeding A. M. P. M. |
|---|---|---|
| November | 12 | 4 and 8 |
| December | 12 | 4 and 8 |
| January | 12 | 4 and 8 |
| February | 12 | 4 and 8 |
| March | 12 | 4 and 8 |
| April | 10 | 4 and 6 |
| May | 10 | 4 and 6 |
| June | 8 | 3 and 5 |
| July | 8 | 3 and 5 |
| August | 6 | 2 and 4 |
| September | 5 | 2 and 3 |
| October | 5 | 2 and 3 |

"One must not forget to give the birds all the pure water they can drink and have a supply of it in clean containers before them all the time.

"Don't forget the green feeds. All through the life of our birds, from the time they enter the brooder until through laying, green feeds—better described as succulent feeds—play a large part in determining first their growth and later their production.

A summer range on green alfalfa or clover will help supply succulence, and during the winter mangel beets or sprouted oats should be fed liberally. Plenty of grit and shell enables the proper digestion of the feed and insures an abundant supply of lime for egg shells."

## THE QUANTITY THAT A HEN EATS AND DRINKS

The average hen will eat from five to eight pounds of food per month, or sixty to ninety pounds a year. This can be reduced if the hens have considerable range and can pick up some of their own food. The daily food eaten by a hen is from three to four ounces. The daily ration for 100 hens is from nineteen to twenty-five pounds.

Hens drink about six pounds of milk a month. One hundred hens drink two and one-half gallons of milk daily.

On limited range a laying hen eats two pounds of grit and three pounds of oyster shell in a year.

While the above are facts, I wish to impress upon you that individuals vary, and that the amount of feed to give a bird cannot be regulated by ounces or measurement. You must carry one bucket of gumption with each two buckets of feed. You must feed according to appetite, weather, season and laying condition.

## THE AMERICAN RATION

The following system of feeding has proven very successful with us in the production of eggs. In winter, the scratch feed is composed of two-thirds coarsely cracked corn and one-third wheat. In the spring and fall they are given equal parts cracked corn and wheat. In summer they get two parts wheat and one part cracked corn. About a pint of this mixture is fed to each ten hens in the morning and about one and one-half pints at night, in a litter of straw. The straw should be from four to eight inches deep. Keeping the hens busy is another of the very important essentials to winter eggs. In addition to the above scratch feed, a dry mash composed of nothing but ground oats is kept before them at all times, in a feed hopper. If ground oats cannot be secured a mixture of two parts bran, one part corn meal, and one part shorts will do. Sour milk or buttermilk is also kept before them at all times. When the milk is not available about 20 pounds of beef scraps should be mixed with each 100 pounds of ground oats. We also add one pound of fine table salt to each 100 pounds of the ground feed. When flocks are kept confined they should be provided with good sharp grit, oyster shell and charcoal. Provide plenty of fresh water. In cold weather it is a good plan to water three times a day to prevent freezing. Between one and three o'clock each afternoon the laying hens should have a moistened mash, using the corn meal, wheat bran and shorts and moistening it with milk or buttermilk, or use of water if the milk is not available. Some sort of green food is essential. For this purpose nothing is much better than sprouted oats. Cabbage, mangel beets, freshly cut alfalfa or clover, or clover hay, will all make very satisfactory green feed. The same feeds and methods may be used successfully with breeding stock, but these should not be fed so heavily as the layers, and the hoppers should be left open only in the afternoons.

It should not be inferred from the above that there is any one best ration for laying hens. There is almost no end to the combination of grains and foodstuffs which can be made. We give below other rations which have proven to be practical, economical and successful.

## A SENSIBLE AND ECONOMICAL RATION

There is no question about wheat being the best single grain food. Wheat screening may be used. When corn sells for less than wheat it can be used for at least two-thirds of the grain ration. In that case, as a scratch grain I would recommend two-thirds corn and one-third wheat. If kaffir corn can be secured more cheaply than corn, then substitute that. If barely is cheaper, then use one-third barley, but let barley be a substitute for your corn rather than for the wheat. If oats can be bought for less per pound than corn or wheat you can use one-third oats, providing they are heavy and are not composed mostly of hulls. If you expect to feed oat grain, it is best to soak your oats 24 hours before feeding. At present prices, or at what they are certain to be soon, we like to use at least one-third cracked corn, and one-third wheat, and you may make the other third of kaffir corn, barley, or oats, if they are cheaper than wheat or corn. If not, then use two parts corn or two parts wheat, letting which ever grain is cheaper constitute the greater portion of your scratch feed. If you can secure, at a reduced price, wheat screenings, wheat which is shrunken, or which has been slightly damaged, but which is free from must or mold, it is often advisable to do this and mix it with your scratch feed. You can use all cracked corn for your scratch grain and wheat by-products for your mash.

One of the best dry mash mixtures, which will go well with any of the above combinations, is as follows:

One hundred pounds bran, 100 pounds of shorts, 100 pounds dairy chops, 50 to 60 pounds beef scraps, 10 pounds oil meal, 3 pounds powdered charcoal, 2 pounds fine salt. Give free access to grit and oyster shell.

You will note I recommend dairy chops instead of corn meal. It is much cheaper and is just as good. This is one of the best mixtures that we can recommend.

## USE GUMPTION IN FEEDING

In summing up the "feeding situation," remember that corn and wheat which is not suitable for milling, and corn and wheat products are your best foods. As long as we can secure them at anything like the prices at which they are now selling, it is advisable to let one or both constitute a good portion of your grain and mash. Remember, however, you can substitute other things for at least a portion of your feed, and bear in mind that, if you are forced to do so, you can do without either.

We have never had any success in feeding cotton-seed meal or millet seed to either young stock, laying hens, or breeding stock. In fact, we have had some very disastrous results. Rice bran may constitute a portion of your mash, if you can buy it cheap. You can also use cracked rice, if the price is right.

Use such of the grains and ground feeds mentioned above as you can buy cheapest. You can take any one of the grains and by using waste and considerable green food your birds will be able to balance a ration that will meet their requirements. On account of the scarcity and almost prohibitive price of various grains, which are also constantly changing in price, it is practically impossible to recommend any one ration or any one grain and say that this is the only food. Make substitutions and use your own good common sense in applying the suggestions here offered.

## A STANDARD RATION FOR LAYERS

Representatives of certain Agricultural Colleges and Experiment Stations met for the purpose of compounding a uniform and standard ration to recommend. This is what they recommended:

| | |
|---|---|
| Cracked corn | 500 lbs. |
| Feed wheat | 100 lbs. |
| Heavy oats | 200 lbs. |
| Barley | 200 lbs. |
| Total | 1,000 lbs. |

In order to allow the mixer to adjust the amounts of the various ingredients in such manner as to take advantage of supply and variation in prices, the following variation in the amounts of each constituent is allowed. Cracked corn may vary from 40 per cent to 60 per cent of the total ration, or from 400 to 600 pounds in each 1,000 pound mixture. Feed wheat is to be constant at 10 per cent, or 100 pounds in each 1,000 pound mixture. Oats and barley may each vary from 10 per cent to 30 per cent, or from 100 to 300 pounds in each 1,000 pound mixture.

The dry mash mixture recommended to be fed with the above grain is as follows:

| | |
|---|---|
| Wheat bran | 100 lbs. |
| Wheat middlings | 100 lbs. |
| Corn meal, corn feed meal, or hominy | 100 lbs. |
| Gluten feed | 100 lbs. |
| Crushed or ground oats | 100 lbs. |
| Meat scrap | 100 lbs. |
| Total | 600 lbs. |

No modifications are allowable in the mixing of this mash, as it is not deemed that such will be necessary or appropriate, and, furthermore, even light changes in the relative proportions of the various constituents might be of such a nature as to materially injure the balance of the ration. In order that the only good standard grades of various feeding stuffs shall be used, the following minimum analysis must be guaranteed, viz., not less than 20 per cent of protein, 50 per cent of carbohydrates, 5 per cent fat, and not more than 7 per cent of fiber. This mash mixture contains approximately, depending on quality of ingredients, 22 per cent of protein, 60 per cent of carbohydrates, 5 per cent of fat, and 5.8 per cent of fiber.

Feed equal amounts of mash and grain. If you wish to increase egg production, induce your birds to eat more mash. Breeding stock should eat less mash and more grain.

## A SIMPLE AND CHEAP RATION

A very simple ration which we have been using and which produced practically as good results as any we have ever used, which contained a large per cent of wheat is as follows:

SCRATCH FEED

| | Yolks | Whites |
|---|---|---|
| 400 lbs. Cracked corn | 1,040 | 500 |
| DRY MASH | | |
| 150 lbs. Wheat bran | 228 | 312 |
| 150 lbs. Wheat shorts | 279 | 334 |
| 50 lbs. Beef scraps | 108 | 450 |
| 4 lbs. Fine charcoal | ... | ... |
| 3 lbs. Fine salt | ... | ... |
| Total | 1655 | 1596 |

If the above feeds are not available it might pay you to have your local dealer import them for you, if possible, and the prices justify.

The cost of this feed can still be reduced by feeding sprouted oats. We feed equal parts of the above scratch feed and dry mash. For every 100 pounds of the corn chops which is to be fed, add one-half bushel of oats which have been sprouted. After they have been sprouted it makes about one bushel of feed. These offset the "all corn" scratch feed. We feed some of the dry mash in a moistened state each afternoon. Give all the moist mash the hens will eat in about 30 minutes. Moisten it with water or milk. Feed the dry mash in a hopper or box and keep it before the hens so they may help themselves at any time. Feed about an equal amount of the dry mash and cracked corn and regulate the quantity of cracked corn which you throw into the litter for the hens by the amount of dry mash each pen consumes. The nutritive ratio of this feed is about 1:4.5, if the oats are used as directed. This is about right for laying hens or growing stock. If this is used for growing stock, add five pounds of bone meal to each 100 pounds of ground feed. The moist mash and sprouted oats offset the difference in yolks and whites shown above. If you use the rations recommended in this bulletin, at the present prices of eggs you will clear more on your hens than in any previous year. In the above ration, the succulent oat feed and the wheat products and beef scraps in the mash, offset the fattening and heating effect of the "all corn" scratch feed. Corn products are eliminated entirely from the mash, except that the cracked corn is screened and the meal and fine particles of corn are sifted out and put in the mash; otherwise, this would be wasted. Keep grit and oyster shell constantly before the fowls.

## ONE METHOD OF CUTTING OUT WHEAT

A method of cutting out the greater part of the one hundred million bushels of wheat annually fed to poultry in the United States and Canada, as recommended by the western section of the American Association of Instructors and Investigators of Poultry Husbandry at their meeting held at the Oregon Agricultural College, is presented by Prof. James Dryden, head of the poultry department. Prof. Dryden does not give this as the best under all conditions because of the wide variation in prices of the different ingredients, but as prices were in Oregon in the latter part of August. What effect the federal price regulations and the new corn crop will have was not then apparent. Hence, just what will be the most economical rations during the coming year he finds it hard to say. The recommendations for Oregon under the prevailing August prices are as follows:

"First, the whole wheat may be displaced by oats and barley. While the prices of all these feeds, especially the oats and barley, varied widely even in different parts of the state, as well as at different times, a general average of prices per ton for some of the main feeds was as follows: Wheat, $80; oats, $55; barley, $53; bran, $36; shorts, $40; and corn, $80.

"Whole wheat is not essential to a satisfactory egg yield, which depends more on the proper variety of food than any other single item," says Prof. Dryden.

"Ground grains or mashes are fed heavily. The by-products, bran, shorts, middlings, linseed and cotton seed meal, are relatively cheap. The following ration was recommended:

Oats, 25 pounds; barley, 15 pounds; bran, 10 pounds; middlings or shorts, 8 pounds; ground oats, 5 pounds; charcoal, 4 pounds; ground corn, 5 pounds; linseed meal, 5 pounds; buttermilk, 45 pounds; meat scrap, 5 pounds; kale or other greens, 44 pounds; grit, 3 pounds; shell, 2 pounds.

"These are average amounts of feed per hen per year. Should the price of corn go down to $1.50 per bushel or less, as much corn as oats and barley could be fed to advantage.

The mash is best fed in the evening, so that the hens will work better for the whole grain, which should be scattered in a deep litter of straw. About as much mash as whole grains may be fed, either dry or mixed with skim milk, buttermilk, or water. The beef scraps is kept in a hopper or box before the hens all the time. If the mash is dry fed the scraps is added to the mash, and unless milk is fed in some way the amount of the scraps is doubled so that it constitutes about 20 to 25 per cent of the weight of the dry mash. The amount of whole grain should be so regulated that the hens will eat plenty of the mash."

## A TEXAS RATION

The following, known as the "Texas Ration," has been used in Texas and various other vicinities with fairly good success:

| DRY MASH | |
|---|---|
| Wheat Bran | 15 lbs. |
| Corn Meal | 30 lbs. |
| Ground Milo | 35 lbs. |
| Meat Scraps | 20 lbs. |
| | 100 lbs. |

| SCRATCH FEED | |
|---|---|
| Whole Corn | 40 lbs. |
| Oats | 15 lbs. |
| Whole Milo | 45 lbs. |
| | 100 lbs. |

Feed this ration in equal parts of mash and grain; feed the mash in a dry mash hopper and the grain in deep litter. Feed twice each day, morning and evening.

## THE MAINE RATION

The following ration was first adopted at the Maine Station, and has been widely used with good results:

| | Parts by Weight |
|---|---|
| Wheat bran | 2 |
| Corn meal | 1 |
| Middlings | 1 |
| Gluten meal or brewer's grains | 1 |
| Linseed meal | 1 |
| Beef scraps | 1 |

This mash was kept before the hens at all times. In addition each one hundred hens were given, early each morning, four quarts of whole corn, scattered in from six to eight inches of litter. Again at ten o'clock in the forenoon they were given two quarts of wheat and two quarts of oats in the litter. While the results obtained from the above ration were good, there was considerable trouble from indigestion, due to the richness of the dry mash. On this account the mash was later modified somewhat.

## ONTARIO EXPERIMENT STATION RATIONS

The following rations have been tested and recommended by the Ontario, Canada, Experiment Station. The summer ration for yarded fowls consists of grain fed twice daily, wheat in the morning and wheat and barley, or corn, in the evening, corn being fed only when very cheap. In addition a dry mash is kept before them at all times. For old hens the mash consists of nothing but bran. For pullets it consists of equal parts bran, low grade flour, and barley chop or meal.

For hens confined in the house in winter, the dry mash is as above. The grain ration is as follows: In the morning they are given whole wheat in a litter six to eight inches deep. About noon they get a little more wheat and whole mangels or clover hay. About 3:30 p. m. they are given a wet mash composed of boiled vegetables, waste bread and kitchen scraps, thickened with the same meal used in the dry mash, with about 10 per cent or beef scraps or animal meal added.

## CORNELL METHOD OF FEEDING

The following whole grain mixture is fed morning and afternoon in a straw litter:

| By weight Winter | By measure Winter | By weight Summer | By measure Summer |
|---|---|---|---|
| 60 lbs. wheat | 32 qts. wheat | 60 lbs. wheat | 32 qts. wheat |
| 60 lbs. corn | 36 qts. corn | 60 lbs. corn | 36 qts. corn |
| 30 lbs. oats | 30 qts. oats | 30 lbs. oats | 30 qts. oats |
| 30 lbs. buckwheat | 20 qts. buckwheat | | |

The following mash is fed dry in a hopper kept open during the afternoon only:

| By weight Winter and summer | By measure Winter and summer |
|---|---|
| 60 lbs. corn meal | 57 qts. corn meal |
| 60 lbs. wheat middlings | 71 qts. wheat middlings |
| 30 lbs. wheat bran | 57 qts. wheat bran |
| 10 lbs. alfalfa meal | 20 qts. alfalfa meal |
| 10 lbs. oil meal | 8 qts. oil meal |
| 50 lbs. beef scraps | 43 qts. beef scraps |
| 1 lb. salt. | ½ pt. salt |

Prof. Rice, of Cornell, has this to say about feeding:

"Feed in the proportion of about two pounds of grain to one pound of ground feed. This is for egg production. You will find that the last statement is an important factor in any ration. If you were to allow the hens to eat three or four pounds of grain for every pound of ground feed, they would not be getting enough of the ground feed ration. You will find it hard to get them to eat more than one-third by weight of ground feed. The only way you can regulate the amount of grain with the ground feed is by the amount you feed in the morning. If you feed only a small amount of grain in the morning and make them work for it, when you open the hoppers for the noon meal, they will eat more than they otherwise would. If they have too much grain in the morning they will not eat enough mash. Leave the hopper of ground feed open during the afternoon; they will not eat too much, but will be hungry for the night feeding."

## SOME EGG LAYING CONTEST RATIONS

Some very successful Egg Laying Contests have been held in the East, and for the information of those interested we give their feed formula. The ration seems to have given good results, but is a little too complex for the average farmer or poultryman.

Dry mash is kept constantly before the birds in hoppers, and mash feeding is indulged at will by the layers until 3:30 P. M., when the automatic grain feeders are opened, and the fowls help themselves by operating its simple mechanism until bedtime.

Grit, oyster shell, and charcoal are in permanent and constant supply, and are consumed as the necessities of the fowls require.

No changes are made in either of the rations in winter or summer, as it is believed fowls will not overeat in warm weather or underfeed in cold weather; in fact, this has been conclusively proven in these competitions.

Following are the two rations:

The coarse beef scraps used in the scartch grain is obtained by sifting the beef scraps as ordinarily purchased, the proper proportion of the coarse going into the grain mixture and the remainder, or fine and coarse mixed, becoming a part, in correct proportion, of the dry mash.

The following ground and whole grains are used in the quantities given:

### DRY MASH

| | |
|---|---|
| Coarse bran | 200 lbs. |
| Coarse meal | 100 lbs. |
| Gluten feed | 100 lbs. |
| Ground oats | 100 lbs. |
| Standard middlings | 75 lbs. |
| Fish scraps | 30 lbs. |
| Beef scraps | 30 lbs. |
| Low grade flour | 25 lbs. |

### SCRATCH GRAIN

| | |
|---|---|
| Cracked corn | 60 lbs. |
| Wheat | 60 lbs. |
| Heavy white oats | 40 lbs. |
| Barley | 20 lbs. |
| Kaffir corn | 10 lbs. |
| Buckwheat | 10 lbs. |
| Coarse beef scraps | 10 lbs. |

## THE NEW JERSEY CONTEST RATIONS

For years the Egg Laying and Breeding Contests in New Jersey have been making new records for high production, both from the standpoint of individual hen production as well as flock averages. Throughout this period of years, one ration has been fed continually with marked success. This ration was evolved after years of careful study and practice in an effort to find a combination of feeds which provided the correct food nutrients and which was economical in cost. These New Jersey contest rations are as follows:

DRY MASH

| | |
|---|---|
| Wheat bran | 100 lbs. |
| Wheat middlings | 100 lbs. |
| Ground oats | 100 lbs. |
| Corn meal | 100 lbs. |
| Meat scraps | 100 lbs. |

This is a ration composed of five ingredients in which 20 per cent of each ingredient is used. This mash is kept before the birds continually in self-feeding hoppers.

SCRATCH RATION

| | |
|---|---|
| Cracked corn | 200 lbs. |
| Wheat | 100 lbs. |
| Heavy oats | 100 lbs. |

This grain ration is fed morning, noon and night in deep litter. In the summer 100 pounds of cracked corn is eliminated, making the mash during the warm months equal parts of cracked corn, wheat and oats. These rations are supplemented with all the required extra and condimental feeds such as succlent feed, grit, shell and charcoal.

## EPSOM SALTS AS A POULTRY FEED

It was at the Egg Laying Contest in New Jersey that Prof. Lewis first discovered the importance of Epsom salts in the ration for heavy layers. It had previously been observed that birds in heavy laying condition were generally laxative, while the non-laying hen was inclined to be constipated. Appreciating the importance of the laxative condition in layers, especially when they are fed large amounts of feed containing animal protein, experiments were conducted which showed the wonderful advantage of feeding the layers Epsom salts regularly in their drinking water. The rules which were followed at the New Jersey contests and which are now almost a universal practice on the commercial poultry farms of the Eastern coast, are as follows: Epsom salts are fed in the drinking water every two weeks regularly at the rate of one pound to one hundred birds. The salts are dissolved in all of the water which the flock will drink in one day. That is, they should not be given too concentrated. In cases of colds, roup or epidemic diseases of any kind, the feeding of Epsom salts, in the proportions mentioned here, but at more frequent intervals, possibly every four or five days, is a very valuable method of aiding in the control of such disturbances. The Epsom salt barrel is now much a part of the feeding room equipment as is the mash barrel or the grain bin.

## FEEDING IN WINTER

The kinds of foods used in winter should contain more heat and fat producing elements. We, therefore, usually require more corn in our winter ration than in summer months.

We also compel the hens to take more exercise. This can be done by making the morning feed rather limited and feeding more liberally at night. Do not allow the fowls to fill up and then stand around all drawn up. Encourage activity during the winter months, if possible.

## THE METHOD OF FEEDING THE HENS IN THE AMERICAN EGG LAYING CONTEST

In the American Egg Laying Contest at this place the following method of feeding is being used:

SCRATCH GRAIN

Mix 25 lbs. Shrunken or Slightly Damaged Wheat
25 lbs. Cracked Corn

Or vary the proportion of corn and wheat according to the price, using the largest proportion of the grain which is cheapest; otherwise, use equal parts of each. Feed one quart to every fifteen hens each morning. Feed one and one-half times that much at night.

## DRY MASH

The following dry mash mixture is kept before the birds at all times:

100 lbs. Wheat bran
100 lbs. Shorts
75 lbs. Corn meal
75 lbs. Ground oats
75 lbs. Beef scraps
50 lbs. Dried buttermilk
15 lbs. O. P. Oil meal
5 lbs. Powdered charcoal
5 lbs. Fine salt
500 lbs.

We see that the hens eat as much mash as grain.

We take a small quantity of the same dry mash and moisten it with sour milk, buttermilk or water. We give all the birds will eat in about 30 minutes' time each day. The moist mash is fed about 2 P. M.

Grit and oyster shell are kept constantly before the birds.

## A MISSOURI RATION

The Missouri State Poultry Experiment Station is recommending a ration as follows:

"There is an advantage in feeding a variety of feeds as well as in different forms, part of the ration being whole or cracked grain, and the rest ground feed.

" A ration may be made as follows:

| | | Yolks | Whites |
|---|---|---|---|
| Grain: | 200 lbs. corn | 520 | 250 |
| Mash: | 20 lbs. shorts | 37 | 45 |
| | 20 lbs. bran | 30 | 42 |
| | 20 lbs. ..oats | 46 | 42 |
| | 20 lbs. corn meal | 51 | 23 |
| | 26 lbs. meat scraps | 26 | 254 |
| | 306 | 710 | 656 |

"One and one-half pounds of salt and five pounds of bone meal may be added to the above mash mixture.

"Feed all the grain the hens will eat in 20 minutes, morning and evening, and leave dry mash before them all the time or feed moist mash once per day."

## A GOOD BUT COMPLICATED RATION

### GRAIN MIXTURE

2 parts cracked corn
2 parts wheat

### · DRY MASH MIXTURE

200 lbs. wheat bran
200 lbs. wheat middlings
200 lbs. corn meal
200 lbs. rolled or ground oats
150 lbs. dry beef scraps
75 lbs. alfalfa meal
50 lbs. dried buttermilk
25 lbs. O. P. oil meal
8 lbs. fine table salt, no lumps
25 lbs. fine granulated charcoal

The winter months are not the natural laying season for a hen. If you expect eggs during these months, you must provide her with as nearly summer conditions as possible. It is not necessary to heat your houses, but they must be comfortable. The hen must have exercise. She must be provided with green food and with meat food. The hen must be bred right and have a natural born tendency to lay.

The mash is kept in a hopper where the hens have access to it at all times. At one o'clock each day we give them a handful of this mash moistened with buttermilk. Don't give a feed of it, but just enough to whet their appetites so they literally fight for it. Feed this on a clean board or trough provided for the purpose. Also give sprouted oats three times a week, or oftener if possible, or cabbage, beets and turnips may be substituted for the oats, but should be ground or chopped fine. Once every four weeks dissolve in water one-third or one-half of a teaspoonful of Epsom salts for each fowl, moisten the mash with this, and feed the fowls. Decrease the amount of corn and corn meal used during the hot summer months. If the fowls have free range you can also dispense with most of the beef and alfalfa meal during these months.

In spite of all the feed we place before some hens, they still refuse to lay. A hen must have a born tendency to lay if she is to be a high producer. More depends upon the strain, and upon the breeding, than upon the variety of breed. Some flocks or strains of Plymouth Rocks lay better than others; the same is true with Wyandottes, Leghorns, Reds, Orpingtons, and all other breeds. In one of our experiments I had two different strains of Barred Plymouth Rocks in the same house. They were given exactly the same food, fed the same amount and at the same time each day. One pen laid eggs and made a high record all during the winter. The other pen in the same house ate nearly as much, but all they ate went to fat. One strain had a born tendency to lay, the other strain had a born tendency to produce fat and flesh. After years of observation, I have come to the conclusion that you must feed your hens if you expect them to lay, and feed them well and plentiful. If you find that certain individuals in the flock become too fat and do not lay, and some die because they are overfat, I frankly believe your flock is better off because of their death, and, if they become overly fat and do not lay, I would kill them for table use. The ones which are left are the producers, they eat and, storing it into fat, they take what they need for their own use and manufacture the surplus into eggs. These are the birds which it will pay you to keep and breed from. If you have a pen of Plymouth Rocks, or any other breed, which uses all the feed you give them to store up fat, and still do not lay, you had better dispose of them and get a fresh start of some strain which you know does lay.

## FEEDING DURING THE MOULTING PERIOD

The cow, the horse and other animals which carry a coat of hair, shed their hair in the spring and put on a new and thinner coat for the summer. The hen moults in the late summer or fall and puts on a new winter cloak at that time. The old feathers die during the summer, and many of them fall out from time to time. At moulting time, all the old feathers die and are cast off, and an entire new coat is grown. Inasmuch as there is one-fifth as much nitrogen in the feathers as there is in the entire body of a fowl, it is obvious that the manufacture of an entire new cloak of plumage in such a short length of time is an enormous strain on a fowl's system. It is a very trying time in the life of any fowl. A fowl's feathers represent about five per cent of the bird's total weight, and there are about 8,000 feathers on every bird. Some hens moult twice in a single year. It usually takes a hen from two to three months to entirely complete the moult. Older birds moult more slowly and do not shed feathers as rapidly as younger ones. A hen usually stops the production of eggs either during or just preceding their moulting period.

When a bird stops laying in the summer or early fall, she usually starts moulting. The later a hen lays in the summer, or the longer she lays, the greater will be her production, so that the high producer is the late layer and hence the late moulter. The length of time that a hen has been moulting or has not been laying can be determined by the moulting of the primary feathers. It takes about six weeks to completely renew the primary feathers next to the axial feathers, and an additional two weeks for each subsequent primary to be renewed.

A steady drain on the system exists at this time and the fowls must have foods rich in protein, fat and feather-building material. They need foods rich in nitrogen, for building feathers. It is best to add a little more meat food at this time, and also some linseed oil meal. Sunflower seed are also good. We also increase the amount of corn chop during the moulting season. We use the same mash we ordinarily use and add to every 100 pounds of the mash 10 pounds of linseed meal and 15 pounds of beef scraps. If this shows any indication of causing diarrhea, then reduce the amount of these two ingredients and add a little more charcoal.

## METHODS TO BE PRACTICED DURING THE MOULT

The question is often asked, "Can I force my hens to moult?" Yes, you can, but we prefer to let nature take its course rather than to produce a moult by starving. The birds can be starved for about two weeks, that is, given very little but water and succulent green food, and then follow this by feeding considerable quantities of food rich in protein, such as beef meal, beef scraps, and oil meal, and thus cause the old feathers to dry up and drop off and new ones to take their place. The starving reduces the fat and the heavy feeding of protein following that helps build the new feathers.

Practically this same thing can be accomplished in another way, but it is done by feeding rather than starving, as given below. If you prefer to let nature take its course and you do not desire to interfere or influence the time of moult, then I would add at least 10 or 15 lbs. more of beef meal or beef scraps to each 100 lbs. of your regular dry mash, and add 10 lbs. of O. P. oil meal to each 100 lbs. of mash used. Feed this as soon as a number of your hens have moulted and during the period in which they are growing new feathers. Always feed liberally on tender green food at this time. Then go back to your regular method of feeding.

Some men are making a practice of pulling out the large wing and tail feathers, especially after the birds have been starved for a few days. They also pick some of the other feathers if a bird is to be sent to an early show. You must be careful not to injure the bird by so doing. The birds are then fed for feather growth.

One of the best plans for feeding for a moult is that recommended by Mr. E. W. Good. His method is as follows:

"The main reason that a hen fails to moult in hot weather arises from the fact that she has too much fat. A hen will stand more fat to produce eggs than to produce feathers. There is a good reason for this. Feathers require more protein than do eggs. This is also the main reason why it is so hard to produce eggs and feathers at the same time. When it comes to egg production the hen is far from a perpetual machine. Her constitution and system demand a resting period, which is provided by nature. It should be observed that the moulting season is marked by a lack of appetite. This should not discourage the feeder. Let the fowl fast—all the better. During her fasting the fat is being reduced. This will loosen the feathers. After the feathers are fairly well removed her appetite will return. She can then be put on an egg ration.

"I have selected corn meal, wheat middlings, wheat screenings, beef meal, oil meal and gluten feed for the following combinations. These foods should be varied in their proportions. It is planned to divide the moulting season into three periods: The first is calculated to loosen the feathers; the second, to meet the returning appetite and produce feather material; and the third, to place the hen upon an egg-laying basis again.

For the first moulting period mix 38 pounds of corn meal, 11 pounds of middlings, 23 pounds of beef meal, 5 pounds of oil meal, 12 pounds of gluten feed. By weight, feed one part of screenings to three parts of this combination. This period is intended for the month of June, but it may take place a month or so later, according to the fancy of the feeder. It will do no harm to allow the hopper to stand open constantly, but be sure to keep it in a separate room from the dusting place or scratchery. There is too much dust in ground foods already without adding more. Each period is to occupy about a calendar month.

"For the second period take 46 lbs. corn meal, 15 lbs. middlings, 21 lbs. beef meal, 3 lbs. oil meal, 9 lbs. gluten and thoroughly mix as before. The proportions are five parts of scratch to 12 parts of ground foods. This formula may be considered the connecting link between the starving rations and the egg producing one. It will still remove some of the fat, but at the same time will supply feather material.

"The combination for the third and last period, is 54 lbs. corn meal, 19 lbs. middlings, 19 lbs. beef meal, 2 lbs. oil meal and 7 lbs. of gluten. The proportion between scratch and hopper feeds is one part of the former to two parts of the latter. While it may be impossible to follow the above directions to the letter, the best results are obtanied by feeding as closely to the standard as possible. Kindly observe that this contains three separate formulas, as distinguished from the single formula plan that is so generally practiced.

"Trap-nest records show that hens require from seventy to ninety days to complete the moult. During the first third of this period, when merely shedding old feathers, good hens continue to lay, ceasing only when their food is required to supply materials out of which to fashion the growing feathers. Average layers, properly fed, should not be out of laying due to the moult for a period longer than fifty to sixty days. The older and weaker the hen is in vitality, the slower the moult. Generally the hen that drops a few feathers at a time, replacing them one by one, is not as good a layer as is the hen whose feathers all seem to drop out at once, leaving her bare for a time, although growing the feathers in the latter case is no negligible drain on a hen's vitality.

"The poultryman should specially guard moulting hens from dampness and drafts, provide sanitary, roomy quarters, feed generously and regularly."

## FEEDING THE BREEDING STOCK

We would like our readers to bear in mind that they must make a difference in the method of feeding and handling their breeding stock from that used in handling their laying hens.

In the case of laying hens it is large numbers of eggs that are desired, and you feed the birds all you can compel them to eat, and force production all you possibly can. In that case it is "lay or bust." However, in the case of your breeding stock it is fertile, hatchable eggs, and strong, livable chicks that you desire, so we force the breeding stock to take a lot of exercise by throwing all their grain in a deep straw litter. Reduce the amount of green bone, beef scraps, dry mash, and the amount of highly concentrated foods used. At least, permit the breeding stock to have access to dry mash only in the afternoon. Do not allow them to become overly fat. Compel them to exercise for all their food, and feed them principally on hard grains and green food.

The ideal way to handle the breeding stock is to let them have a rest after the moulting period, and do not encourage egg production until you are ready for them to go into the breeding pens. Simply keep them in good health and on a bare maintenance ration.

Give all the range possible. Give all the green food you can get them to consume. Spade up a few shovelfuls of earth in the yard two or three times a week, and encourage them to work in that. If sour milk or buttermilk is available they make splendid additions to the regular ration.

## RATIONS FOR EXHIBITION FOWLS

In feeding fowls that are intended for exhibition purposes it is of the utmost importance to bring them into the show room in the pink of condition. Skillful feeding is one of the prime essentials to this end.

One of the secrets of carrying off the coveted prizes lies in having the birds up to weight. In order to get them up to weight, especially for the earlier shows, often requires extra heavy feeding. To keep the appetites of the birds whetted and keen while feeding them heavily is indeed a problem. A variety of feed, together with enough exercise to keep them in a healthy condition, is necessary.

Birds that are below weight can be brought up rapidly by feeding a mash composed of ground wheat, corn and oats, mixed with a liberal supply of fresh meat scraps or other protein food. Where available, it is a good plan to moisten the mash with milk, either sweet or sour. This renders the mixture more palatable, at the same time adding to the food value. Great care must be used in feeding wet mashes not to feed the birds too much and thus throw them off their feed and get them out of condition. They should never be given at one time more than they will clean up in ten or fifteen minutes.

In addition to the above mentioned mash, a variety of grains should be scattered in clean straw to induce exercise. Fowls being thus fed should be weighed often and fed accordingly. When up to weight, the amount of mash can be gradually decreased and the amount of whole grain increased.

For the regular feeding of exhibition birds, where it is necessary to rapidly increase the weight, a dry mash consisting of equal parts corn meal, wheat bran, and ground oats, to which has been added a little beef scraps or meat meal may be kept before them in a hopper at all times. If the weather is cool or cold it is a good plan to feed whole wheat in the litter early enough at night so that each fowl may eat what it desires, and still have some left to work on as soon as it drops off the roost in the morning. Cracked corn and wheat may be fed on alternate days at noon, adding a handful or two of sunflower seed every second day. A little German millet thrown into the litter occasionally will both furnish exercise and add to the variety.

No definite rules can be laid down as to the amount of feed to be given. This must be governed by the variety, climate, season, health and condition of the birds, etc. The old adage that, "Practice makes perfect," is especially true in the feeding of exhibition birds.

## ENGLISH METHODS OF FEEDING

When the war came on many feeds were prohibitive in England, as was wheat in this country. For that reason a ten guinea prize was offered for the best suggestion for suitable substitutes and methods. The prize was won on the following by Mr. Herbert Howes, and I especially recommend what he has to say about the English method of scalding food:

"The feeding of poultry has been a source of worry and anxiety to the poultry keeper for some months and more so since the restrictions, prohibiting the use of certain cereals, have come into force. That the situation is serious, no one will deny, but it is not so critical as some imagine and there seems some possibility of procuring certain meals, if only in limited quantities. These, if used in conjunction with by-products, should form a very useful mixture for poultry feeding.

"During the last two years, continuous trials have been made with certain by-products and the results have fully justified the use of same. The cost of feeding has been considerably reduced, the egg supply good—in some cases increased—and further,the health of the stock all that one could desire. Not a single case of ovarian trouble, nor any apparent sign of over-fatness has been recorded. Therefore, the writer, after using a mixture consisting chiefly of by-products, and finding that poultry can be kept and made to pay well without the continuous use of grain and pre-war methods of feeding, takes pleasure in stating the mixture of the foodstuffs, and the manner in which they have been used.

"Of these by-products, some of which were regarded as waste before the war, we have clover meal, malt culms, brewers' dried grains, palm kernel meal, fish meal, meat meal, bran and shorts—middlings. Respecting the qualities of the above mentioned by-products likely to be on sale, it is a somewhat difficult matter to state accurately. From inquiries made, information is at hand that there is not likely to be a scarcity of clover or palm kernel meal and also that there will be a fair quality of malt culms and brewers' dried grains. Much depends upon the restrictions relating to the brewing of beer.

## FOODS AND THEIR VALUE

"The feeding value of some of the above meals are well known to many poultry keepers. Palm kernel meal is the richest of the lot and should only be used in limited quantities. It is easily digested and if used in the correct proportion has no ill effect upon the fowls. The next in food value is malt culms, containing again a good percentage of the necessary ingredients for egg production, and being bulky, forms a cheap and satisfactory meal, in brewers' dried grain a good percentage of albumonoids are present and more fibre. They are somewhat coarse, but not so easily digested as malt culms. Clover meal is an excellent and economical by-product, a splendid substitute for green food and, being rich in lime, its everyday use should have a good effect on laying birds and help to produce good shelled eggs with rich colored yolks. Fish meal, the substitute for animal food, is well known as an excellent egg producing meal. Owing to its high percentage of albuminoids and offensive odor, not more than 10 per cent of the mixture should consist of this. Meat meal is another excellent substitute for animal food. It is rich in albuminoids and fats and should be used with discretion. The analysis of the above meal is as follows:

| | Album. | Carbohydrates | Fats |
|---|---|---|---|
| Palm kernel meal | 12.4 | 45.8 | 9.5 |
| Malt culms | 20.3 | 47.4 | 1.3 |
| Dried grain | 18.7 | 32.1 | 5.7 |
| Clover meal | 8.1 | 42.0 | 1.3 |
| Fish meal | 40.9 | .... | 2.2 |
| Meat meal | 58.7 | .... | 12.6 |
| Shorts—middlings | 13.4 | 46.2 | 4.3 |
| Bran | 12.2 | 40.9 | 2.9 |

"Now it is very important that the above mentioned meals should be carefully blended to get the best possible results. It is not a question of using a quantity of this, that, or the other. No doubt many failures can be traced to a slip-shod manner of feeding. We all know that when out for egg production, it is essential that the foods consist of egg forming matter, but only a certain percentage is necessary. Too many albuminoids have a tendency to force and irritates the ovary and oviduct and protrusion of the oviduct follows. Shell-less eggs are also traced to too-forcing diet. Carbohydrates and fats in certain percentages are as essential to the upkeep of the bird's body as the first mentioned property, but again one can do harm by using same injudiciously.

### A PRODUCTIVE MASH

"In most of the by-products one gets a high percentage of fibre, and, although of no great value from an egg producing point of view, yet by the addition of foods containing a large percentage of fibre we get a bulky mixture, thereby lessening the cost of feeding. Bulk alone is useless. The other essential qualities in their respective percentages must be introduced into the mash: To get the real food value from the mixture it is necessary for the material used to be scalded overnight or allowed to soak at least one hour before using. Scalding undoubtedly adds to the value, because the food is more easily digested when given to the birds and greatly improves the whole mixture. Both fish and meat meal are improved by scalding. As previously mentioned, the present day poultry feeder is out for a cheap, bulky food and it is obtained by mixing the ingredients mentioned in the following proportions:

| | |
|---|---|
| One part by measure | Malt culms |
| Two parts by measure | Clover meal or clover |
| Two parts by measure | Bran |
| One part by measure | Shorts or middlings |
| 1-8 part by measure | Fish meal |
| 1-2 part by measure | Palm kernel meal |

"The best plan of preparation is to measure out the separate ingredients into a mixing bin and thoroughly blend together. Little or much can be mixed at one time, according to quantity required. So long as the meal is kept dry it will keep for an indefinite period and there is no need to fear that it will deteriorate in value.

### HOW TO PREPARE THE MASH

"The quantity required for one meal should be placed in a bucket and sufficient hot water added to moisten same. It is important to add the right quantity of water so that the mash is of the desired consistency when ready for feeding. Cover the meal with a sack or cloth to keep in the steam. The mixture should next be turned into a bath and sufficient shorts added to form a crumbly mash. Only a small quantity will be required if the meal is carefully soaked. When vegetable matter or household scraps are procurable they should first be thoroughly cooked, the water strained off, and the rest chopped up finely and mixed with the dry meal. Very little, if any, water will be needed when this is done, and the drying off process is the same. We get in the above mixture the necessary properties for egg production and a bulky mixture. The proportion of albuminoids being one to three of carbohydrates and fats, there is nothing in the mixture likely to fatten. It can be used for morning and night feeding with excellent results. Place in a trough if the fowls are confined, and in small heaps on clean grass if they are enjoying liberty. It seems quite an easy matter to recommend the above meals, but the writer's experience is that so few local merchants stock the by-products, and, in consequence, many small poultry keepers are unable to obtain them. It takes time for one to convince the local miller that there are good feed values in many of these apparently new foods. The prices quoted at this time are:

| | |
|---|---|
| Malt culms | 16s 6d per cwt. |
| Bran | 14s 6d per cwt. |
| Clover meal | 10s 6d per cwt. |
| Palm kernel meal | 16s 6d per cwt. |
| Fish meal | 22s 0d per cwt. |
| Shorts | 15s 6d per cwt. |

### COST PER BIRD

"The approximate cost of food for one week per bird, allowing them 4 to 4½ ounces per day, is three pence, one half penny (=7 cents). In many cases household scraps or spare by-matter may be added and used as directed, which effects a saving in the food bill. No grain is necessary for fowls kept on the Colony system. Where the Semi-Intensive system is followed, a little grain may be given with advantage. Those kept on strictly intensive lines should receive one ounce of grain per day. This replaces one ounce of the mixture, making the cost about the same. Some will say that this is not cheap feeding. We are asked for economical feeding. Economy means obtaining the highest possible value for money spent and here we have all that is necessary to keep a laying bird in good condition." One of the foremost farms in England uses this mixture:

Mash

50 lbs. bran
50 lbs. middlings
50 lbs. maize meal
50 lbs. fish meal
1 lb. salt

Keep the mash in a hopper. Cracked maize fed as grain in the morning.

One remarkable thing they did on many farms in England during the war was to dispense with scratch grain entirely. One farm, that kept hundreds of hens, did not feed scratch grain for two years and their egg supply did not diminish.

Other poultrymen's methods which are practiced in England are as follows:

I.

| | |
|---|---|
| Middlings | 3 lbs. |
| Maize meal | 2 lbs. |
| Ground oats | 3 lbs. |
| Bean or pea meal | 3 lbs. |
| Fish or meat meal | 4 lbs. |

To every 3 lbs. of the above mixture add 2 lbs. of bran and 1 lb. of clover meal.

Scratch grain ¾ oz., per hen per day.

II.

For cutting down grain ration: equal parts.

Palm kernel meal
Middlings
Rice meal
Bran
Fish meal

Hopper open most part of day. Hot weather close from 12 to 4.

III.

1 part bran
1 part middlings
1 part maize meal
1 part brewers' grains
1 part malt culms
1 part fish meal
½ part clover meal

IV.

Middlings 2 parts by measure
Ground oats 2 parts by measure
Maize meal 1 part by measure
Fish meal 1 part by measure
Clover meal 3 parts by measure
Bran meal 3 parts by measure

To each bucketful add 2 parts of bran.

I have a letter from an egg farmer in England giving me particulars regarding the difficulty he has in getting feed. These are his own words:

"I am using nearly all soft feed made up of middlings, cocoanut cake, fish meal, and bone meal, and I am getting 100 dozen eggs per week."

One of our Canadian students, Mr. Geo. Keith, is well posted on English methods and conditions and he aided me in securing the above facts as they actually exist.

## FATTENING RATION

When poultry is being fattened for market, there are two objects in feeding. The first is to put on the largest possible amount of flesh in the shortest time and at the least cost. The second is to have the meat tender, sweet and juicy at the close of the feeding period. There can be said to be no best fattening ration. Several are in general use which meet the requirements admirably. They are given herewith. The one should be chosen which is most available and seems best to meet local requiremnts.

### RATION NO. 1

| | |
|---|---|
| Corn meal | 70 pounds |
| Low grade flour | 30 pounds |
| Dry beef scraps | 20 pounds |
| Wheat bran | 10 pounds |

Mix about 2 pounds of buttermilk or sour milk with each pound of the above mash mixture, and feed all they will clean up in 20 or 30 minutes. Also, give them all the grit and charcoal they will eat.

### RATION NO. 2

| WINTER | SUMMER OR FALL |
|---|---|
| 60 lbs. corn meal | 20 lbs. ground oats |
| 25 lbs. low grade flour | 50 lbs. corn meal |
| 5 lbs. wheat bran | 20 lbs. wheat bran |
| | 10 lbs. low grade flour |
| 6 gal.condensed buttermilk | 6 gal. condensed buttermilk |
| 10 gal. water | 10 gal. water |

The above mixture is thoroughly mixed and heated until it is quite warm, then fed in troughs three times daily. All that is not eaten in 15 or 20 minutes is removed. No water is given during the entire feeding period, which lasts from 14 to 15 days, until within a few hours of when the poultry is to be killed. Grit may be supplied in the form of gravel or sand two or three times during the feeding period. It is not essential, however. The mixture is not heated except in winter.

### RATION NO. 3

For Yellow Flesh:
- Five parts corn meal (yellow
- Four parts middlings
- One part ground oats
- One part animal meal

For White Flesh:
- Two parts corn meal (white)
- Two parts ground buckwheat
- One part ground oats
- One part animal meal

With either mixture use two pounds of milk to each pound of the ground grain. Supply grit and charcoal. Other fattening foods will be found in the Market Poultry Lesson.

## SCALDED AND COOKED FOODS

Cooking improves the value of some foods, yet in some cases, the increased value does not pay for the extra labor. If the moist mash which is given laying hens and growing stock can be scalded, as is done by English poultrymen, mentioned on a previous page, it will add to the digestibility and, also, to the palatability and value of the mash. It also pays to boil bones, oats, vegetables, and clover, or else grind them. Scalding and cooking will improve some foods and add greater variety.

## VALUE OF MOISTENED FOODS

We have had excellent results from the use of moistened mashes. Much more moistened food is used in England than in this country. Our experiments have led us to believe that we can increase the number of eggs, and, also, the size of the eggs a trifle, by the use of a moistened mash fed to the laying hens each afternoon. It also seems to stimulate growth and quick development in the young stock. Never feed it sloppy, but just moist and crumbly. Use milk or sour milk with which to moisten it, if such is obtainable. If you haven't milk, moisten the mash with boiling water. Let it steam for two hours before feeding. Cover the feed while it is being steamed.

The moistened mashes are more quickly digested than the dry foods. They pass through the crop and gizzard more quickly. We feed just about what the fowls will clean up in about thirty minutes. We usually use about the same mash to moisten that we are feeding in the hoppers in a dry state. If fed in moderation we will get better results by using more moistened mashes.

## EXERCISE AND LITTER

A reasonable amount of exercise is a good thing for poultry. Breeding stock, especially, should be compelled to take exercise the year round, but we do not compel the laying stock to take excessive exercise. When the great dairy cows are put on a year's test at the Experiment Stations to make their world's records, they are not allowed to exercise. Every bit of energy and food is used in manufactuing milk. Every switch of the tail, every movement of the foot, exhausts just that much energy. If allowed to consume too much food and energy in exercise, you do it at the cost of eggs. Laying hens should be compelled to take just enough exercise to keep in good health, and no more.

The litter should be clean and free from mold and must—this is important. As to the kind of material used for litter, this is not so important. Clean straw, clover, alfalfa, leaves, cowpeas, or moss are used by some with equally good results.

One of the best ways of furnishing exercise is to compel the fowls to range in a corn field, orchard, or over a clear piece of land or timber in search of a portion of their food.

## MECHANICAL FEEDING

Hand feeding is not necessary in all cases. Unless the feed man possesses some common sense and will use it, the hens are sometime better off if the feed is placed before them and they are allowed to help themselves. The mash should always be fed in hoppers.

There are many kinds of mechanical devices on the market. Some are good, some are bad. Some of the automatic feeding devices are very satisfactory indeed. From these the hens work in the grain as they need it. If the feed man uses good judgment, however, we prefer to have the grains fed by hand.

## TIME TO FEED

Fowls should have a light feed each morning. The heaviest feed should be in the afternoon just long enough before night so that the fowls can become well filled before dark. From one to four o'clock in the afternoon is about the right time to feed a moistened mash. By that time most of the hens have laid and are out to get their portion of the feed. Some poultrymen have a practice of throwing each morning's grain into the litter each night after the fowls have gone to roost. The grain is ready for them then at daylight in the morning. You should have regular feeding hours each day. The hens will expect you at that time.

## FEEDING UNDER ARTIFICIAL LIGHT

I have tried to lengthen the day and the hours of feeding by installing electric lights in a poultry house. In the dead of winter, I increased egg production 100 per cent by this method. The lights went on just before dark and burned until eight o'clock. They came on again in the morning at six and burned until daylight. This lengthened the day about four or five hours and gave the hens just that much more time to consume food. During winter, egg production falls off because the cold requires more food consumption, and, also, because the length of the day barely permits the hen to consume much more than she needs for bodily maintenance. These extra hours give her a surplus for the manufacture of eggs. As to whether or not this will pay, depends upon the cost of your electric current.

The use of artificial illumination to stimulate egg production in the winter is now a practice in quite general use among the commercial poultry farms of the Unted States. The use of artificial lighting is primarily a feeding problem. The artificial illumination is provided at such time that the birds can consume additional feed in order to give them the necessary food nutrients to maintain themselves and to produce eggs during the winter period when the days are very short and the nights long. Regardless of what method of lighting is used, additional feed must be given the birds if the full benefit from the use of lights is to be realized. A normal flock of layers, unlighted, will consume during the winter months approximately from ten to twelve pounds of grain per one hundred hens per day. These same birds, under lights, would readily consume approximately fourteen pounds of grain per day. The birds must always be fed heavily of grain during the lighted period in order to keep them on the floor working and in order that they may avail themselves of this lighted period to get the extra feed required. The evening lunch method is becoming very popular. This method is the one where the birds are given artificial lights for one hour in the evening. The ideal method of feeding birds under this method of illumination is as follows: They should be given a good dry mash kept before them constanty in hoppers. Some of this same mixture can be fed in the form of a crumby moist mash during the day if desired. They should be fed an abundance of grain in deep litter, this grain ration being fed three or four times a day as follows: Three pounds to each one hundred birds as early in the morning as possible after the birds are off their perches. A light scratch feed, consisting of about two pounds of grain, can be given about noon. A medium feeding of grain, consisting of about four pounds of grain to one hundred birds should be fed about one-half hour before sundown. The heaviest grain feeding of the day, consisting of at least five pounds to each one hundred birds, should be given at 8 o'clock in the evening or when the lights are turned on. If too much grain is fed in the late afternoon, the birds are not sufficiently hungry at the evening lunch period to take full and immediate advantage of this extra feeding hour. Where one does not wish to feed grain at noon, the morning feeding can be increased to four or five pounds instead of three. In this combination of feeding, the moist mash can probably best be fed about 10 o'clock in the morning. There is one very important fact to consider when feeding birds under lights and that is this: Any hen laying heavily has a tendency to become thin or to become reduced in body weight due to the extreme strain of heavy production. This condition must be avoided and the tendency counteracted by a heavy grain feeding. If any flock of layers, due to faulty feeding, shows a marked increase in weight, they are very apt to go to pieces in the early spring and suffer a pronounced drop in egg yield. Were this flock of birds to be maintained in good condition of flesh, no such spring drop should be anticipated. If you use artificial illumination, remember the reasons for which you are using it. Remember that egg production falls off during the cold weather because most of the food consumed is required to heat the bird's body and also because the short day barely gives the bird time enough to consume food enough to take care of her bodily needs. The extra hour provided by illumination, gives her time to get a surplus of feed to be used for the manufacture of eggs. The profitableness of this practice will depend upon the number of birds one expects to put under lights and the cost of illumination. In general it may be said that it is a most profitable practice if properly run.

## HOW TO DETERMINE THE AMOUNT TO FEED

If you are feeding breeding stock, make them hustle and rough it to some extent. They must take lots of exercise. They should not be fed all they will eat. They must not be allowed to become very fat. Open the dry mash hoppers only in the afternoons. Keep them on a bare maintenance ration except during the breeding season when they must be fed a little more freely. It is vigor and fertile eggs we want in this case, not quantity.

You can tell whether or not you are feeding the hens too much by examining their crops and the flesh on the breast after the hens have gone to roost. If their crops are full and their breasts feel as if the hens are in good condition, they are doubtless getting about the right quantity of feed. Never feed so freely that the hens will allow a lot of the feed to remain on the floor or ground.

If you are feeding laying hens, they can be fed all they will eat. If they are properly bred they will not become too fat to lay. If they do become too fat, it is best to market them. Keep the hoppers open and feed about a pint of grain each morning to each ten hens, and about a pint and a half at night. If when you examine their crops at night, you find they are not getting enough to eat, then feed more. If they are getting too much feed, then cut down the amount. There is not much danger of overfeeding the hens after they have started to lay. In feeding our laying hens we give them about all they will eat. In this case, we go on the principle that it is numbers of eggs that we want and we feed the hens with this idea in view, and "they must lay or bust."

## EVERYONE AN EXPERT

When it comes to the question of poultry feeding, practically everyone considers himself a "Natural Born Expert" in that line. Practically every poultry raiser has his own ideas as to how the thing should be done, and, as a rule, there isn't much that you can tell him. Feeds vary in variety, quality, and price in different sections of the country, and no absolutely set rule can be given as being the best. Also, the feeding problem is made more difficult because individual birds in a flock vary as much in their needs, in the quantity and kinds of foods they will consume, as do human beings. Some individuals will be inclined to become too fat, others will not be getting enough food. For these reasons, we must strive for a ration and a method of feeding that will get the best results, not for an individual, but that will prove best for the flock on the average. You can thus readily see the difficulty in successful poultry feeding.

## FEEDING BABY CHICKS AND GROWING STOCK

In our lesson on "The Baby Chick," this question is thoroughly discussed. It is not necessary to repeat what is said with reference to that question at this time, but, if you desire information on the best method of feeding baby chicks or growing stock, you should refer to that lesson. Any good laying food is a very good food for growing stock from six weeks of age to maturity.

## A SIMPLE AND GENERAL PURPOSE RATION

We think best to give you a very simple ration as a basis from which to work. It can be used in feeding either growing stock, laying hens, or breeding stock. The grain mixture is composed of two parts wheat and one part corn in summer months; two parts corn and one part wheat in winter months; and equal parts of each in fall and spring months.

This grain should be fed in a deep litter, about a pint to each ten hens, night and morning. Ground oats should be kept in a hopper, or if you cannot secure the ground oats at a reasonable price, then substitute a dry mash of equal parts corn meal, bran and shorts or middlings. Provide grit, oyster shell, charcoal and green food. Give the hens nothing to drink but sour milk or buttermilk. A little of this same mash moistened with sour milk or buttermilk and fed to the laying hens each afternoon will increase egg production some, and also increase the size of the egg a trifle. Use fifteen to twenty per cent of dry beef scraps, with the dry mash, if milk is not obtainable. The above is a ration which is adapted to the feeding of growing stock, breeding stock or laying hens. The ration given on another page as the "Missouri Ration," is the best method we have ever used for laying hens. One thousand hens fed this ration averaged 162 eggs each in twelve months.

Hens and pullets which are intended for breeding purposes should not be fed heavily and forced for egg production before the hatching season, for they are likely to be run down in vitality, and the chicks will not be thrifty and vigorous, and will not mature rapidly. Practically the only change necessary in this ration is some slight variation in the quantities fed for the different purposes. It is not necassary to have a great variety of feed formulas for these purposes. It should not be understood that it is absolutely necessary to follow this ration exactly. It can be modified to suit conditions. The ration is given as a standard because the articles are staple nearly everywhere and compose the cheapest ration. If other foods containing the same nutrients are found to be cheaper and more convenient, substitutions may be made. There is not, and probably never will be, any ration formulated which will suit all kinds of fowls at all times and places, and still give universal satisfaction without any exercise of judgment on the part of the feeder.

You who have had any considerable experience with poultry, have no doubt had more or less trouble with both old and young stock flipping food from the hopper, even when you had side boards on the hopper, so to speak. This is often due to the fact that the hopper contained some foods which the stock liked better than some other kinds of foods, and of which they perhaps needed a greater quantity in order to properly balance their ration. The nature of the birds is to select such foods as are necessary for their physical needs, and they will usually balance their own ration if given the chance. We often overdo the thing when it comes to feeding poultry. We try to rely too much upon our own ideas and whims, and fail to give the hen credit for having any sense or natural instinct, or ability to select for herself.

## THE SYSTEM NEEDS REST

Don't expect your hens to lay every month in the year. No matter what method of feeding you may use, the hens will not lay every month or every day in the year. If they did they would be very short lived. A hen needs rest the same as any other living thing. If she does not get it, her system will be weakened and her constitution will soon give way. She must have time to moult. She must also have time to rest and recuperate.

An egg contains a great quantity of rich food constituents. The hen takes the raw material and turns it into a finished product. It requires lots of energy to digest sufficient food to maintain her own body and manufacture 200 eggs in twelve months.

You should not any more expect the hen to lay every month in the year than you should expect a tree to bear fruit every month in the year. Nature has so arranged things that the tree is given a rest in winter months. It is just as reasonable to expect a tree to bear fruit every month as it is to expect a hen to lay every month. There must be a period of rest for everything or its constitution will give way sooner or later. So, do not be disappointed if the hens take a rest in the summer or fall. Manage your hatches, your methods of breeding and feeding so that your hens and pullets will take this needed rest and begin laying again by winter months when eggs are highest.

## ESSENTIALS IN POULTRY FEEDING

1. Cleanliness—Drink and feed
2. Quality—Wholesome and untainted
3. Quantity
4. Whole, cracked and ground grains
5. Palatability
6. Variety
7. Regularity
8. Exercise
9. Access to fresh earth
10. Adaptability
11. Economy.

5 G's:
Grit
Grains
Greens
Grubs
Gumption

These eleven essentials can be summed up as follows:

1. The importance of cleanliness cannot be over-estimated. If poultry is forced to eat, live and sleep amidst filth, disease is almost certain to follow.

2. The quality of the food should be unquestioned. It should be wholesome and untainted.

3. It is necessary that you use some judgment and vary the quantities as your judgment dictates, and it is necessary to balance your ration for best results.

4. Whole, cracked and ground grains should be used for best results, some foods being better fed in one form than another.

5. There is no use trying to force birds to eat certain foods which are not palatable.

6. We should provide for some variety. This itself makes the food more palatable.

7. Few of us realize the importance of regularity in our feeding practices. In the National Egg Laying Contest they have certain hours for everything. The large majority of the 1,000 hens are out watching for the feed-man when the time has arrived for certain feeds. If he is a few minutes late the hens are seen walking back and forth along the fence like a lion in a cage, anxiously looking for the feed-man. If you expect the hens to be regular in the production of eggs, you must be regular in pour practices with the hens.

8. Exercise is very essential. The hen will lay more, she will be in better health, her comb will be redder and brighter, and she will sing and appear happiest when compelled to work some for her food. She is one of the few creatures in life that seems to enjoy work and never crows, cackles or brags about what she does until she has delivered the goods. Give her exercise. Laying hens do not need so much exercise as breeding stock.

9. If poultry is raised and kept on one piece of ground continuously for a number of years, and the soil is not cultivated, it is certain to become sour and filthy, and may get in such a state that it is impossible to raise or keep poultry on it. Cultivate the ground and grow some green food in your yards. It sweetens the soil and enables you to grow green food.

10. The foods which you use should be adaptable to the purpose for which they are intended. That is, for baby chicks, growing stock, or laying hens, try to select foods adaptable for that particular purpose.

11. There is such a variety of foods which are suitable for poultry that it is not necessary that the ration for poultry be extravagant. We must look out for the simplicity and economy in compounding a ration. A good poultry food for stock of any age cannot well be compounded without it consists of the 5 G's—Grit, Grains, Greens, Grubs and Gumption.

If pullets are intended for the production of large quantities of eggs after they have been properly matured, they must have a larger quantity of food; that is, they must have more than enough for mere maintenance of the body. Each hen takes a certain amount of food to maintain her body, to satisfy her own bodily needs, and the surplus which you give her she manufactures into flesh or eggs. If fed liberally and she puts on flesh and lays few eggs, it would indicate that she had been bred for meat production. If she lays large numbers of eggs and puts on little surplus flesh with this surplus food, it indicates that she was bred-to-lay, or shows a born tendency to lay. We can scarcely consider the science of feed without also touching on breeding, for, in my opinion, if poultry has not been bred, to some degree at least, for egg production, all the feed which you might give a hen in excess of the bare maintenance of her body would not materially increase egg production. In other words, I mean to say that breeding and selection is vastly more important than is any group of feeds which I might recommend. The object in feeding a hen, in my opinion, is not to feed eggs into her body; by this I mean the ovules, or small eggs, for nature has placed these there, but the object in feeding is to develop these ovules which breeding and nature have already placed and made a part of the ovary of a hen. No feed which you might give a hen would overcome a mistake in breeding or would produce within that hen something which nature had not provided for and made possible. Some hens are so built that it is not possible for them to lay but few if any eggs. Therefore, you can see the necessity of breeding for egg production.

At the Missouri State Poultry Experiment Station, while I was in charge of same, we had three pens of Barred Plymouth Rock hens in the egg laying contest to which we wish to call your attention. A hen in one of the pens laid 245 eggs, while a hen in another pen laid 17 eggs. The latter's abdomen became so filled with fat and its weight caused it to drop so low that it actually dragged on the ground until the hen wore a hole in it the size of a half dollar, and they had to kill her because of this fatty condition. The first pen of Barred Rocks, from which the first mentioned came, averaged nearly 200 eggs per hen, the second pen of hens averaged between forty and fifty eggs each, and three of the five hens in this pen died during the twelve months because they were overly fat.

Both pens drank from the same pan, ate from the same hopper, roosted in the same house, and ate the same grains. Still another Barred Rock hen from another strain in an adjoining pen did not lay an egg. No amount of feed, nor any change of feed, would have made one of these hens lay an egg, and neither would have caused the overly fat hens to produce enough more eggs to pay for the extra caution and care in feeding them. It wasn't in them, and the feed could not produce results which were not obtainable. If I find a hen in my flock, to which I am giving good treatment and good feed, becoming very fat and not laying well, I place her on the market. You do not want to be breeding from such stock, and she is a menace to your flock.

If your stock has been properly and carefully selected and bred, you can adopt much more simple methods of feeding than are now practiced by many of our Agricultural Colleges, Experiment Stations, Egg Farms and Fanciers, and get equally good results. To use plain terms, I think we too often use "gingerbread, pie and cake" methods of feeding our hens and young stock. During the past winter a manager of a poultry farm in my state went to a large poultry show in a neighboring state with an exhibit of about ten or twelve birds. The manager returned home with but few blue ribbons, but turned in a bill for $12 for lettuce. The lettuce alone fed to those birds amounted to more than all the premiums won the entire season. Such extravagant and foolish practices account for many of the failures in the poultry business. Our feed formulas are too often too complicated. The farmer and the average poultry breeder will stick by his old methods and absolutely refuse to accept or put into practice the more scientific methods recommended by Agricultural Colleges and Experiment Stations if those methods require the farmer to be continually buying a dozen or two different things which he cannot produce on his farm, and which further require him to feed one thing for a few days and another for a few days, etc., and which require him to keep a private secretary to keep him informed as to the many changes necessary. In order to get the average farmer to adopt better methods, we must simplify them as much as possible. If the hen is properly bred to begin with, and she is kept in comfortable quarters, if you provide her with sufficient wholesome food, and keep the drinking pan filled, you can feel reasonably certain of satisfactory results. However good a feed formula or a method might be, if it is so complicated that the average farmer or poultry breeder will not adopt it and put it into practice, then it is of little practical value.

My final word of advice to you is this: If you are meeting with success with your present method of feeding, then be slow to change it for my method or anyone's else method. For the present, or, at least, until the Experiment Stations have had time to reduce the feeding of poultry to a science, I would practice simple, common sense methods and not allow myself to be confused by high sounding terms, like nutritive rations, digestive co-efficients, and such like. Study, that you may master these questions, of course, but results, and not theory, are what count after all.

## EGG TONIC FOR HENS

If the right foods are used, tonics are unnecessary. The limited use of stimulants may be advised in some cases, but we especially discourage its use with stock intended for breeding purposes.

If you wish to use something of this sort, here is a formula which is a good one:

| | |
|---|---|
| Blood meal | 5 lbs. |
| Bone meal | 5 lbs. |
| Mustard | 3 lbs. |
| Saltpeter | 1 lb. |
| Flowers of sulphur | 1 lb. |
| Venetian red | 2 lbs. |

The saltpeter should be finely powdered and the Venetian red that is produced from iron. Some Venetian red is nothing but earth or mineral dug from the ground. Mix ingredients thoroughly. The Venetian red can be left out if not readily obtained, and some increase the quantity of mustard to five pounds.

Feed a heaping tablespoonful to each twenty-five hens once a day in a wet or dry mash. If in a dry mash it must be thoroughly mixed. The dose can be increased or lessened to meet the requirements of the case. There is nothing in the formula that will injure the hens even when given in many times the prescribed dose.

It is necessary that the stimulant be fed in connection with full feeds of an egg-making ration, for unless the hens have plenty to work on, the stimulating of their desire will avail nothing. We cannot induce hens to lay unless they have all they need to eat, and the better the feed the more they will lay.

When hens have recovered from the moult, have full plumage, but their combs are still shrunken and they are not inclined to lay, it will stimulate them into production.

Another use for the "strikebreaker" is where pullets are fully matured yet show no signs of laying. They are large enough but have made no growth of comb. Here the stimulant will help them.

## ANOTHER FEED STIMULANT

We seldom use or recommend a stimulant for egg production, but the following method comes highly recommended, and you might try it out on a portion of your flock and note results. We are told to mix:

Three lbs. fish meal, 3 lbs. beef scrap, 3 lbs. bone meal, 3 lbs. oil cake meal, 3 lbs. chili or cayenne pepper, 3 lbs. blood meal, 2 lbs. charcoal, 1 lb. Epsom salts, 2 lbs. sulphur, ½ lb. table salt.

Add one pint of this mixture to a gallon of bran and mix thoroughly. Then add this to ten gallons of fresh cut clover or alfalfa, or steamed or boiled clover or alfalfa hay, with just enough water to make the bran stick to the clover or alfalfa.

Double the amount of bran and mixture to ten gallons of clover for the Mediterranean classes. This amount will feed seventy-five hens.

## TO FORCE HENS TO LAY

A prominent and old-time poultryman gave me the following formula to force egg production. You can try it out for yourself:

### FORMULA 'A"

"Stir into the water for the daily mash, one drop of Tincture of Cantharides for each four or five hens.

### FORMULA "B"

Stir into the water for the daily mash, one teaspoonful of Common Black Gun Powder for each 30 or 40 hens.

"Feed formula 'A' each day for one week and then alternate with formula 'B,' i. e., feed 'A' one day, 'B' the next, and so on.

"It is not necessary to feed these condiments every day after the first three weeks; once every three or four days will be often enough then, but feed formula 'A' every fourth day all winter. In mild weather once a week is often enough. Each time 'A' is fed, the following day feed 'B.'

"Remember that 'A' is a poison and must not be fed carelessly or left within the reach of the children. It will not harm the hens if fed as directed; on the contrary, it will promote health and vigor. In the use of the prescription do not expect immediate results. It takes from two to four weeks for an egg to develop from the ovaries to full size.

"The prescription does not supply material to make eggs, it is not a food. It arouses the disposition to lay; if the hens do not have the food to make the eggs they will start to lay and soon become weakened.

"Some may object to what they call the forcing system on the ground that it must finally weaken the stock. This, in my opinion, is an assumption with no basis of facts. Growing chicks, chickens of all ages—both sexes—to enjoy robust health, require a stimulating condiment; ginger, cayenne, mustard, pepper, etc., have been recommended by accepted authorities and used widely with disappointing results—they are all vegetable condiments, but in this prescription is a combination-condiment containing the stimulating essence of insect life in a highly concentrated form with the minerals, nitre, sulphur, charcoal—it is the natural condiment to promote health in chickens. And of all condiments, it is the only one that will make hens lay eggs. Use it with perfect confidence, you will be pleased and more than satisfied with the results."

## EFFECT OF FEEDING ON SIZE AND HATCHABILITY OF EGGS

There is no doubt that feeding has some effect on the size, also upon the fertility and hatchability of eggs. The following conclusions are drawn from some experiments that have been made along this line:

"The average weight of eggs varies from month to month, reaching the maximum in the early spring when the fowls are heaviest and laying most freely.

"Eggs from White Leghorns do not reach their maximum weight until the hens are at least in their third laying season." I think the same thing is true of other varieties.

"Scanty feeding reduces the number and size of eggs.

"Liberal feeding increases the number and size of eggs.

"Eggs from scantily fed fowls do not hatch as well as eggs laid by fowls fed more liberally.

"The weight of eggs is reduced when fowls are fed a ration in which the necessary nutritive constituents are not present in proper amount or in proper proportions."

## YOLK COLOR INFLUENCED BY FOOD

The different rations will very clearly affect the color of the yolks. When the grain ration consists of wheat, oats, or white corn, fed either alone or in combination with each other, the yolks will be so light colored that the eggs will be quite unsuitable for fancy trade. When the grain supply consists entirely of white corn the yolks will be very light colored, while on the other hand, the feeding of yellow corn imparts to the yolks that rich yellow color which is so desirable in some markets. If you will feed your hens a liberal supply of tender, succulent green food, this will deepen the color of the yolk.

## EATING THEIR DROPPINGS

When poultry eat their droppings it is an indication that their food is lacking in something and you should endeavor to discover what it is. It may be meat food, it may be grit, it may be green food. It imght be due to intestinal worms being passed by fowls thus affected. It is, therefore, a good idea to have the underneath side of the roost poles covered with poultry netting. This permits the fowls to pass back and forth to the roosts, but prevents them from eating their droppings or soiling their feet and then soiling eggs when they enter the nests.

## PRESERVING THEIR DROPPINGS

Poultry droppings have a high fertilizing value for such crops as grass, corn, cabbage, cucumbers, onions, fruit trees, berries and garden crops in general, and when used in connection with bone meal and wood ashes makes a complete fertilizer.

The Maine Experiment Station recommends the following method for securing the droppings of poultry for fertilizer purposes:

"To each 30 pounds of the manure add 10 pounds of sawdust, good dried loam or peat, 16 pounds of acid phosphate and 8 pounds of kainit. Such a mixture will contain about 1.25 per cent of nitrogen, 4.5 per cent of phosphoric acid, and 2 per cent of potash, which, used at the rate of 2 tons per acre, would furnish 50 pounds of nitrogen, 185 pounds of phosphoric acid, and 80 pounds of potash, and at the present price of fertilizing ingredients is worth about $10.00 per ton. The mixture would furnish a well-balanced, staple fertilizer, which, although not fine enough to work well in drills, can be successfully applied with a manure spreader. The treated manure should be well sheltered until time to apply to the land—that is, shortly before plowing."

A container for droppings is given in our lesson on appliances and fixtures.

## BETTER BUY RELIABLE FEEDS

The average poultryman's time is too valuable to spend in growing grains to feed their poultry. While he is growing a dollar's worth of grain, he could be making a net profit of $10 if that same amount of time and energy were devoted to producing eggs and raising poultry. Every poultryman should attempt to grow his own green feed, if space will permit, but we don't advise attempting to raise your own poultry feeds.

The most successful poultrymen and poultry farms, as a rule, buy all their poultry feeds ready prepared. The purpose of this lesson is to acquaint our students with what it takes to make a good feed, how to balance and proportion their feeds, amounts and quantities that birds should be fed, and other important facts which they should know about feeding problems. But in the majority of cases it will pay the average poultryman to buy his feed ready-mixed from some reliable feed manufacturing company, rather than to waste his time in even mixing his own feeds. If you cannot get satisfactory results from commercial poultry feeds that are available and which you can purchase at a reasonable price, then see if you cannot improve your results by using some of the rations recommended in this lesson.

## QUISENBERRY'S FEEDING CHART

| AGE | DON'T FEED FOR 48 HOURS |
|---|---|
| FIRST WEEK | —Feed a Starting Food mixed with a little Hard-boiled Egg or Hot Water. Give this moist, crumbly mash three times a day on a clean board, card board, or paper. Keep some dry Starting Food before the chicks at all times in Hoppers and Feeders. Feed Chick Scratch Grains after fourth day. |
| SECOND WEEK TO 6th or 8th WEEK | —Keep your Hoppers or Feeders well filled with Starting Food where the chicks can get to it at all times Feed some of the Starting Food in a moistened state about three o'clock each afternoon. Give them some Chick Scratch Grain night and morning in the litter. |
| 8th WEEK TO MATURITY | —Change to a good Growing Mash. Keep the Feeders or Hoppers filled with this until the chicks reach laying age. Feed a little of it moistened once per day. Feed coarse Chick Scratch Grains night and morning. |
| LAYING HENS | —Keep a dependable Laying Mash in your Hoppers or Feeders at all times. Feed some of this mash moistened each afternoon. Feed Scratch Grain morning and night. |

## NEVER LET YOUR DRINKING PANS GO DRY

**Regulate your feeding so the chicks and laying hens eat more pounds of mash than they do of scratch grain. Whole or cracked grains alone do not develop chicks or produce eggs.**

Sprouted oats, showing the immense quantity of tender green food which can be provided for your hens during the winter months.

# Questions On Feeding

## LESSON NO. 13

1. What about stale bread as a poultry food; how should salt be used, and what is the function of grit and oyster shell?

2. With laying hens, what proportion of the feed eaten daily goes to maintaining the body, and what proportion to egg production?

3. Why is ground feed a necessary part of the ration of laying hens?

4. Is there any such thing as a "best" ration for laying hens?

5. What is the difference between the digestive organs of birds and other animals?

6. In trying to compound as cheap a ration as possible for laying hens, the price of which food constitute most affects the cost of the ration?

7. In feeding exhibition fowls, what two objects should we have in mind?

8. How long does it usually take a hen to moult? Does it pay to force the moult? And what kinds of feed should be fed to moulting hens?

9. In fattening fowls for market, what are the objects to be attained, and how long should the fattening period last?

10. The feeds and the methods of feeding may be best, but will they bring the proper results if the fowls have not been properly bred and kept in good health? Why?

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# The Baby Chick

**BY T. E. QUISENBERRY**

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## Lesson 14

The hatching egg contains the secret of your success or failure to a much larger degree than you perhaps realize. The eggs, which you place in your incubator are the result of your care, thought and labor for many months and perhaps for years. Have you given the careful attention to your breeding stock that you should? Have you used the proper care in feeding and housing your breeding pens? Have you allowed roup, chicken-pox and unsanitary conditions to prevail in your houses? Have you made your hens happy and contented? Have you culled carefully each season and eliminated from your flock all birds of low vitality, and specimens which would otherwise be undesirable? Your hatching egg in the incubator is but a result of what you have done, or what you have left undone. If you failed in many of these essentials you are to have more or less trouble in your efforts to raise first class chickens. If you sin against nature, there is no way to avoid its consequences. You may not realize it and you may not experience it at the present time, but you will a few months later. You can thus see the importance of doing your work properly long before the egg is ever put into your incubator.

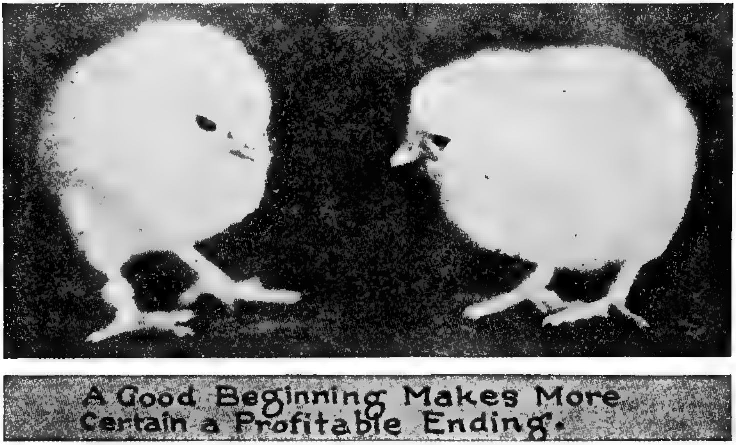


Fig. 1. Two inquiring youngsters. They are full of vitality and are well hatched.

Most breeders who fail blame the weather, their incubator, or brooder. They always place the blame upon everything except themselves. The mere work of turning the eggs and seeing that the temperature is properly regulated and other requirements of that sort are only incidentals in the problem of successful incubation, and the actual success of your hatch depends upon the things which you did, or left undone for weeks or perhaps for months previous to this time.

No set rule can be given for the feeding, care and handling of baby chicks that will apply in every case. In different localities, at different ages and under different circumstances, chickens require different care and attention. The suggestions which are made in this lesson will prove best in most cases.

Realizing that the baby chick is not only a great source of pleasure and profit to hundreds of thousands of people, but that the baby chick is also the foundation of success or failure with poultry, we feel that too much cannot be said to enable the poultry raiser to proceed with this part of his poultry work along sane and practical lines.

The problem of hatching and raising the chicks is one of the poultry farmer's most serious problems. It combines the problem of breeding, the problem of incubation, the problem of brooding, the problem of feeding, and the problem of housing. The failures in the past have been caused in most cases by the failure of the people to be able to hatch and raise chickens to keep up their flocks. The farmer or poultryman who cannot raise to maturity as many chickens each year as he had to begin with is destined to certain failure sooner or later. Your success or failure in the poultry yard each season depends upon your success or failure in raising a reasonably large per cent of the chicks hatched. What are the elements necessary to insure success?

Do not attempt too much, especially if you are a beginner. It is better to keep one hundred chickens and make a profit on them than it is to keep one thousand and lose the profit on all of them.

## THE KIND OF STOCK

It will pay every poultryman or farmer to raise only pure-bred poultry. You will take more interest and pride in them, and thereby give them better care; they attract more attention, and are therefore in greater demand; they bring better prices; they are better layers; you can produce more pounds of flesh and produce it quicker with the same quantity of feed; their eggs are of a more even size and uniform color, and therefore bring better prices; and you sell some of your better stock to your neighbors and customers at a good price. Perhaps you claim it costs too much to get started. To this we reply that most farmers have enough

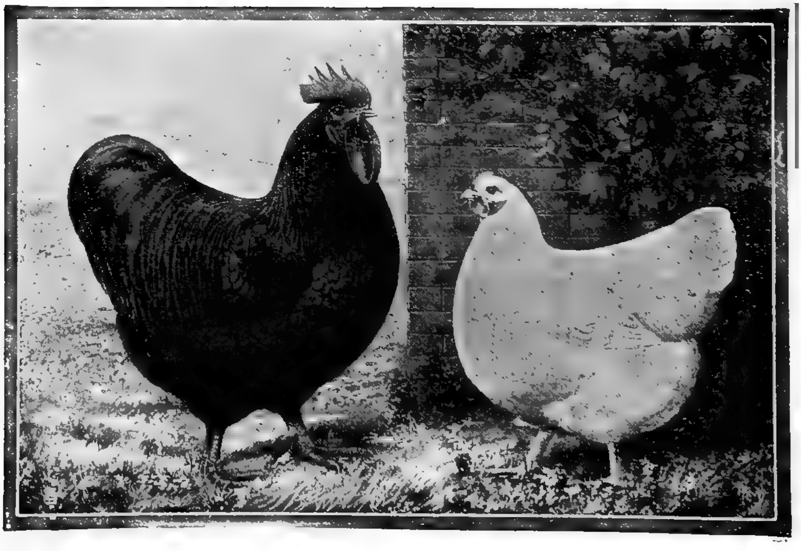


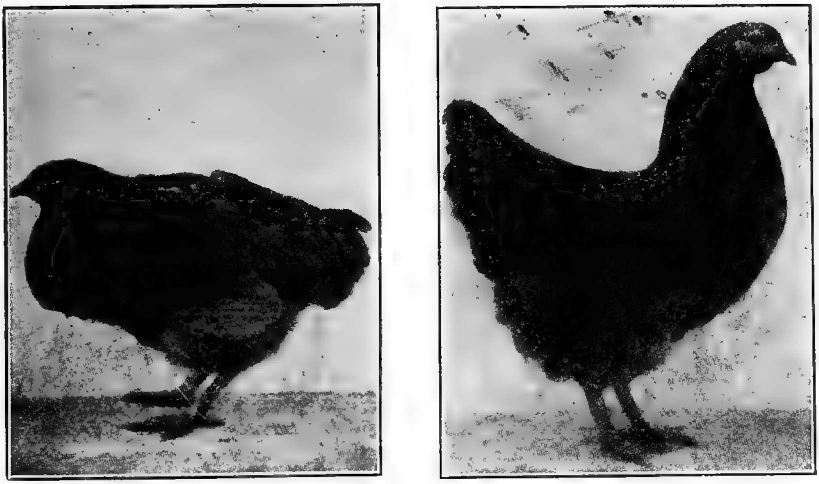
Fig. 2. No farmer or poultry raiser can afford to raise scrub poultry. A flock which is uniform in shape, color and size, like those illustrated above, are more attractive and produce a more clearly uniform product.

old iron about their places which, if it were gathered up and marketed, would sell for enough to buy several sittings of eggs or a trio of good chickens.

## CONSTITUTIONAL VIGOR

The condition and health of the parent stock is largely the secret of the condition and health of the offspring. No question is more important than that of constitutional vigor. We are indebted to Professor Rice and Professor Rogers of Cornell University for some of the thoughts here expressed on this important subject of constitutional vigor.

The actions of the fowl indicate to a considerable extent its physical condition. A weak bird is usually inactive and droopy. It does not scratch or forage actively. The loudness and frequence of the crow of the male and the cackle of the female is an indication of strength. The gallantry on the part of the male as shown in his generosity to the females, as indicated by his calling them and giving them the most tender morsels of feed which he finds, indicates a strong physical condition. The large, bright-red comb and wattles indicate health, as the fowl carries its health certificate on the top of its head. The eye is the mirror of the body and is a good indicator of either health or disease, the healthy fowl having a good, bright, clear eye, while the diseased birl's eyelids seem to droop and present a sleepy appearance. A fowl with a strong constitution generally has fully developed tail feathers. The brightness and briliancy of the plumage is an indication of constitutional vigor. Feathers on a fowl of low vitality usually grow slowly and they appear to be dull and ruffled as compared with the close fitting, smooth, fully developed, bright plumage of the vigorous fowl. The strong bird has a good appetite and a large crop. Do not wait until your birds are fully matured to select your breeding stock. The selection of the vigorous chicks should begin when a few weeks old, and the weak ones should be taken out and placed by themselves and disposed of and never kept for



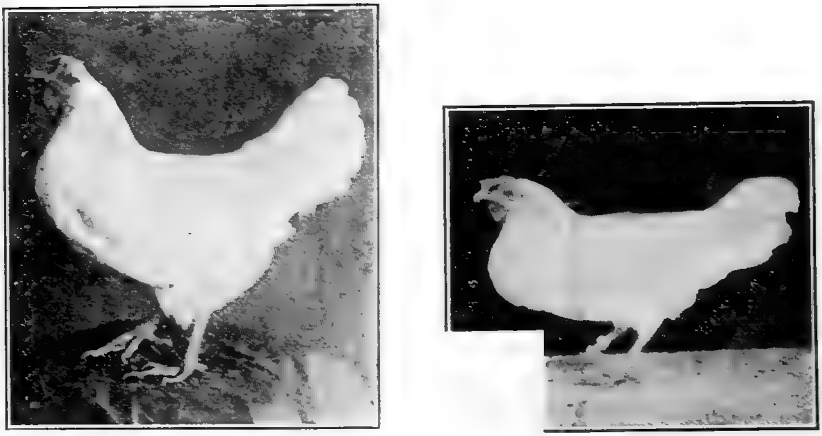
Low vitality. High vitality.

Fig. 3. The above are photographs of two pullets of the same variety which were recently sent to the Missouri National Egg-Laying Contest. The one on the left was of very low vitality and improperly raised in the back yard of a city poultry raiser. The one on the right was properly hatched, fed and brooded, and was given free range and fresh ground on which to range. We cannot see what a man would expect to gain in an egg-laying contest with a bunch of pullets like that on the left.

breeding purposes. The causes of loss of vigor can be summed up as follows:

**First**—Inbreeding, without knowledge of the principles of breeding. Poultrymen sometimes have a bird with exceptionally fine plumage, and for that reason mate the bird and use it in their breeding pens, regardless of its vigor or its relation to other birds in the same pen. There is a distinction between line breeding and inbreeding.

**Second**—Use of pullets and immature male birds. As a rule, our females lay more eggs as pullets than as hens, yet it has been proven by experiment that the chicks from hens' eggs are larger when hatched and that they mature more quickly and produce stronger and more vigorous specimens than those hatched from pullets. A half-grown cockerel should never be used in your breeding yards.



High vitality.
Good producer.

Low vitality.
Poor producer.

Fig. 4. The pullet on the left is a bird of high vitality, and made a record of 258 eggs in one year. The pullet on the right is of low vitality and only laid 46 eggs in one year.

**Third**—Increased egg production. Forcing fowls to lay by continuously feeding heavy, rich foods, and a large egg yield, tells upon the health of the females and often injures their breeding qualities.

**Fourth**—Crowding. Poultrymen make the mistake too often of crowding a great number of birds into small quarters, and then expect the best results from their flock.

**Fifth**—Lack of exercise. If we expect strong, healthy chicks, the fowls in the breeding yard must be required to exercise by forcing them to scratch for their feed in litter, or be given free range.

**Sixth**—Care of eggs for hatching. Eggs for hatching are sometimes kept in places that are too cool or else in places that are too hot, and the eggs are partially incubated before they are set. We should provide nice, clean nests, gather the eggs daily, keep them in a temperature of from 50 to 60 degrees and not hold them more than two weeks before being set.

**Seventh**—Improper incubation. Why buy a cheap incubator which cannot be regulated with any degree of satisfaction, which lacks the proper provision for both ventilation and moisture, which is first too hot and then too cool? The germ is weakened so that it cannot free itself from the shell, and those chicks which are hatched are poor, sickly, scrawny things which die in less than two weeks after hatching and those which do live are low in constitutional vigor.

**Eighth**—Unsanitary quarters. We allow the poultry house to become filled with filth, lice and mites, which suck all the life blood from the fowls, and we then expect to raise strong chickens under such conditions and amid such surroundings.

**Ninth**—Inferior breeding stock. You cannot afford to attempt to raise chickens from a lot of drones, from birds that are not true to type, from weak, sickly poultry, or from birds that have ever been sick with any disease, and then expect to be successful in the poultry business. These things can be avoided, and you should strive to eliminate them.

**Tenth**—Breeding from a flock indiscriminately. Many flocks contain a great many birds which lay only during the spring season. Breeding should be done with birds which are known to be good winter layers.

## SELECTION OF THE BREEDING STOCK

The most serious thought that a poultryman gives his business should be the consideration he uses in mating his breeding pens. When the work is completed take a long look to make certain that you made no mistakes. Your success for next season, and perhaps for several seasons, depends upon your present matings.

In one season you can easily destroy all the beauty of your flock, all their symmetry and markings, and all their inherited egg-laying characteristics, or you may, by giving the proper attention and thought to your matings for any single season, make considerable progress toward perfecting your strain and toward fixing more firmly those characteristics of beauty and productiveness which you may have been a lifetime in establishing. A person who is careless about his matings and who does not carefully study the good and bad points of the males and the females from which he is to breed, can never build a permanent business in purebred poultry, and can never increase the productiveness of his flock. Miscellaneous, careless and promiscuous matings and methods in breeding encourage just such methods in all other work connected with the care and management of poultry.

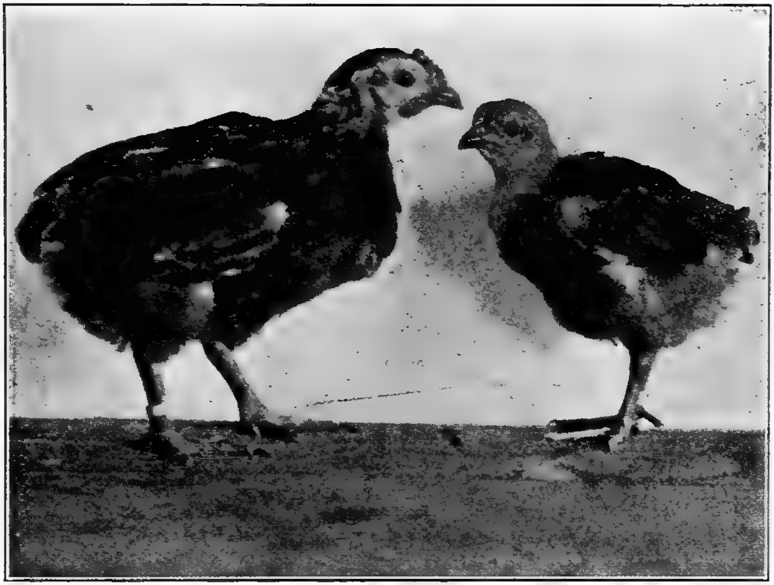


Fig. 5. Two S. C. R. I. Red chicks, both of the same age, both raised in the same brooder and given the same feed. One is bred from vigorous, healthy stock and the other from stock lacking in vitality.

It matters not whether you are breeding for color of plumage, for shape, for meat or eggs, it is vitally important that the breeding stock approach perfection in vigor and constitution. Weakness should be spotted, should be marked, should be eliminated wherever it occurs, either in young or old stock. Without vitality a satisfactory amount of meat cannot be grown upon the carcass. Without vitality the fowl cannot make an economical use of the food which you give it. Without vitality your per cent of mortality is certain to be very high. Unless you are one of the kind who "knows it all" you are certain to make more or less mistakes in your methods of feeding, housing, yarding and other operations in the poultry yard. Even doing the very best which most of us know how to do, we are still defying nature more or less at all times, and the hen cannot withstand mistreatment and wrong methods and be a good producer, and keep it up, unless she has vitality coursing through every vein of her body. More is required of the modern hen, in proportion to her weight, than any other class of farm animals. The destiny of the chick is largely determined before the egg is laid. Most of the lack of fertility and low hatching power of the egg, and the weakness and high mortality among the chickens, is due to a lack of vigor in the parent stock. This very fact has brought about the failure of many poultry enterprises. You can never produce a high laying strain, you can never get that rich, brilliant luster which you so much desire on the plumage of your show birds, if those birds are out of condition or lacking in vitality. This, then, is a question of equal importance to the fancier and the farmer.

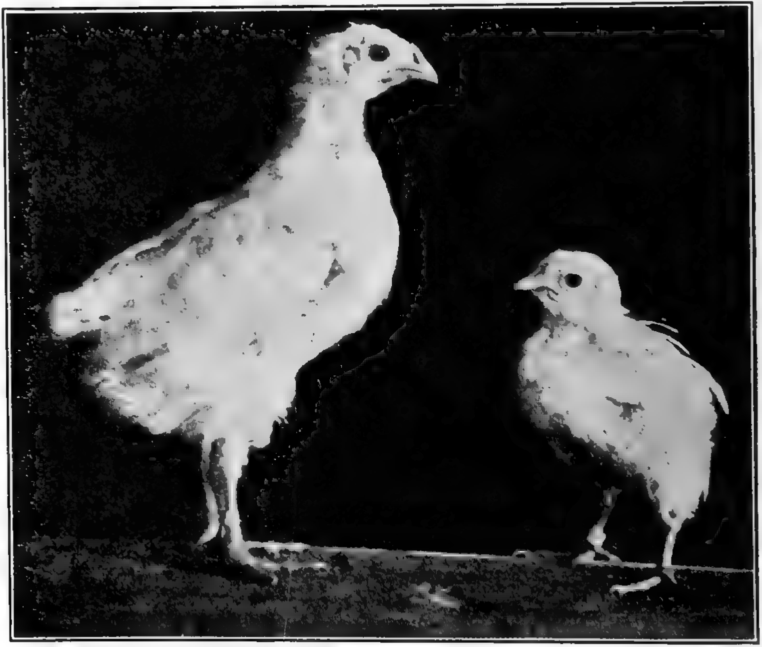


Fig. 6. Two White Wyandottes. Both same age and raised, fed and brooded in same way. Another example of proper and improper methods of selection and breeding.

Consider the following "rules in selection and breeding" when mating your pens:

1. Breed only from stock of high vitality which has never been seriously sick with any disease.

2. Breed from mature males and females. By using mature cockerels on yearling hens, or cock birds on mature pullets, we usually get the best and strongest chicks.

3. Avoid disqualifications.

4. Breed from birds as near ideal in shape and color as possible. A "good all-around" bird is better to use as a breeder than a bird exceptionally good in one point and exceptionally poor in others. Let the male be strong in points in which the females are weakest, and vice versa.

5. Mate your birds early and hatch at least a few early chicks. This will insure you early show birds when others haven't them, and will insure winter eggs when market prices are highest. The stock which is late and immature is the stock which is most subject to roup and colds in the cold, damp days of fall and spring months.

6. Instead of buying ten males at $1 each, and thus getting very ordinary males to head a flock of 100 birds, it is much better to get one good male at $10 and mate him in a separate pen to ten or twelve of your very choicest females. Then no males need be kept with the 90 laying hens on the outside, and you are marketing infertile eggs from those. This insures you the very best results from your prize birds and insures you the highest market price for your market eggs.

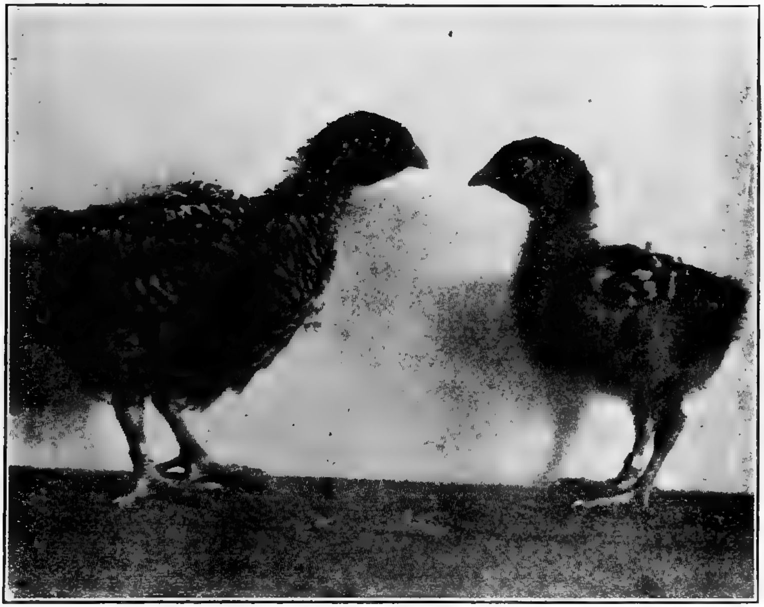


Fig. 7. Two Barred Plymouth Rock pullets. One bred from immature stock and the other bred from stock of proper breeding age. The result is, one is much smaller, slow to feather, and is lacking in vigor. Both hatched in the same incubator, fed the same food and given the same care, and raised in the same brooder.

7. Use only pullets in your breeding pens that matured and began to lay early. Use only hens and pullets which lay during November, December and January. By breeding from early maturing pullets, and hens and pullets which lay in winter months, you can rest assured you are breeding from your best layers, even though you do not use a trapnest.

8. The only certain method of eliminating all the bad points in your flock is by the use of the trap-nest and by pedigreeing your chicks. If you cannot use the trap-nest the year 'round, it will pay you to trapnest at least one pen of breeders in November, December and January

and in the early spring months. The remainder of the season the nests can be discarded. To do this does not require much labor, and you cannot ever attain a high degree of success in any line without at least some work and thought.

9. A common error made by practically all farmers and by most poultrymen who use hens for sitting is that of using the first hens and pullets which go broody in the late winter and early spring to hatch chicks with. These hens and pullets have usually laid well all winter and go broody, and then when spring months come their winter layers are sitting and they are using eggs to go under them from hens and pullets which are drones and from those which have waited until the warm weather of spring has forced them to lay. He who can come nearest eliminating broodiness from his flocks and who hatches eggs from his winter layers will come nearest perfecting a strain of good producers.

10. By all means use males at the head of your breeding pens which are known to be bred from high laying hens. This last rule applied and used in connection with the above nine rules will insure every farmer and every poultryman a high egg yield and the best possible results. Use males from hens which you know positively to be good producers. If the male is from a hen which laid 200 or more eggs, so much the better.

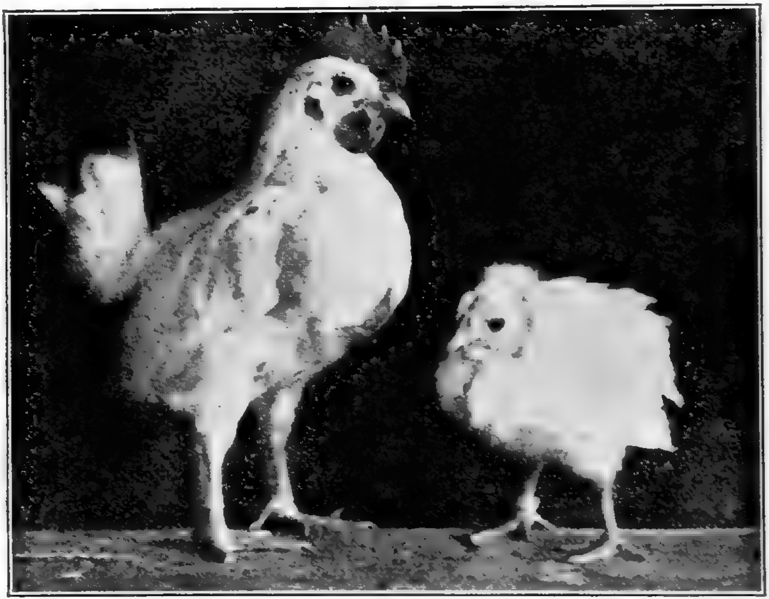
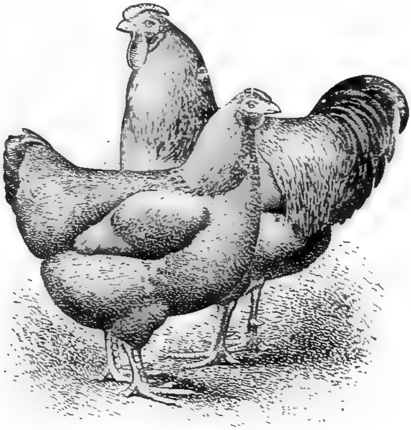


Fig. 8. Two S. C. White Leghorns of the same age. Hatched and raised in the same way. A striking contrast of high and low vitality. Selection and culling must begin with the baby chick and keep it up throughout the life of the fowls.

## SELECTION OF THE FEMALES

Females which are intended for breeders should be well grown and fully matured. Of course, let health and vigor be the first requisites. Do not use any that are greatly under or over Standard size, and only those of correct shape. The mistake is often made of keeping the overly large hens to increase the size of the offspring; also keeping the very small hens, as they will not sell for very much on the market. The overly large and small birds are the poorest producers, and, therefore, should be sold. Do not use poor layers in your breeding pens or those which are continually becoming too fat. The females should be broad between the legs and have bright eyes, not sunken but rather full and prominent. The plumage should be bright and the hen active and a good feeder. Comb and face of healthy color. Never use a hen or pullet as a breeder which lays a small egg, or deformed or thin shelled eggs. See that the females are free from disqualifications. Breed from the pullets which mature first and begin to lay in the shortest length of time. Also use the fall and winter layers for breeders.

The hatchability of the eggs depends largely upon the parent stock. Study your birds during the winter months and pick out the birds which went to laying promptly when through the molt. You will get your largest, strongest, most vigorous and best chicks from hens. A pullet that you thought most of as a pullet may develop some weakness or go badly off in color after she molts, and if you had bred from her as a pullet her chicks would have perhaps shown the same weakness to a greater or less degree. If she comes out of the molt with a good color, is strong and vigorous as a hen, and laid a goodly number of eggs as a pullet, then this bird is most valuable to you as a breeder, and you have accomplished a step in the general upbuilding of the strength and vigor of your whole flock. Male birds should never be used if under one year old.



### CARE OF THE FEMALES

Males should not be allowed to run with the pullets until they are fully matured. See that the pullets are well fed and properly housed and cared for, so that a rapid growth will be assured. Raise them upon free range and compel them to take plenty of exercise. Pullets which are raised in small boxes or small bare yards are really never suitable to breed from. You can raise chickens from them for a generation or two, but they never have the vitality they would have had if they had been properly raised. Raise the breeding stock on free range.

Fig. 10. The care of the female influences the fertility and hatchability of the egg, and also the livability of the chick.

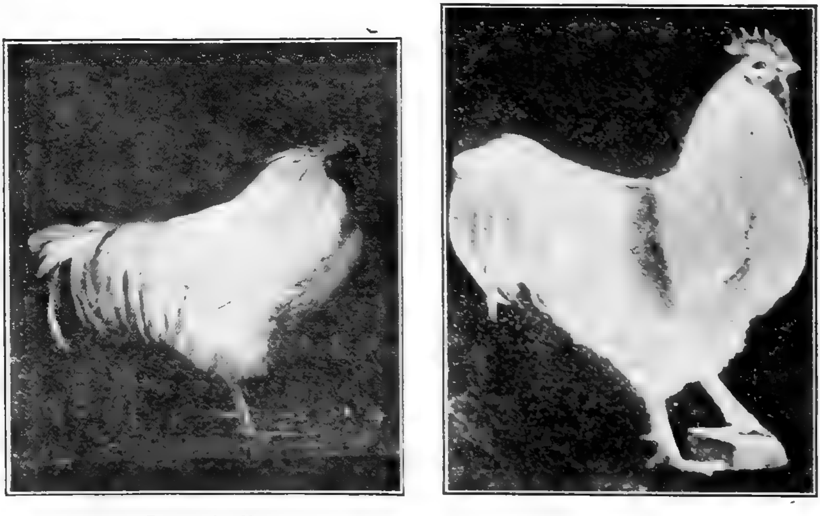
It is a very good idea to trap-nest the pullets the first year and in this way determine the good and the poor layers. Cut out the drones and keep the choicest pullets for breeders. It is necessary to feed them more freely while on the trap nest test than they should be fed as breeders. As soon as the test is concluded and as soon as each breeding season is over, the breeding hens should be put on free range and compelled to hustle and rough it, and kept on a bare maintenance ration until time to make your pens again. Breeders should be handled each year in this way and much of the trouble which we have in raising chicks would be eliminated. Hens intended for breeders should not be forced to lay or allowed to become overly fat. This is very important. This practice alone often means success or failure, You cannot use too great care in the selection and care of the breeding stock. Lack of vitality in the little chicks is responsible for the greater per cent of their deaths, and this is often due to lack of vitality in the parent stock. It is a bad practice to allow many males with the females during the hot summer weather or during the molt.

## CARE OF THE BREEDING MALE

Simply because a male is a good fighter, it is not always true that this same bird will make a good breeder. However, we would prefer to breed from one that is not a coward in preference to one that shows lack of courage and lack of physical strength.

Males which are intended for breeders should be allowed to run with females occasionally. They are less liable to become sterile, and are not so apt to develop bad habits as they are if kept constantly and only in the company of other male birds. Males should not be allowed to run with females continuously while too young, or they may become somewhat stunted in growth, but let them run with hens occasionally. They will learn to become more gentle, attentive and gallant when placed in a pen with hens. There is great danger of the young males becoming sterile if never allowed to mate with hens; the same is true of the old males.

While the male is molting he should be penned in a run to himself in dry, comfortable quarters and be well fed until his feathers are reasonably well matured. If the male should develop long, sharp spurs, or has sharp toe-nails, he will often injure the backs of the females and



Low vitality. High vitality.

Fig. 11. Here are two pictures which have never been retouched. On the right is a White Plymouth Rock male bird of high vitality and a beautiful bird to breed from. On the left is a bird of low vitality. The other vigorous males in the pen have "picked on him," treaded him and abused him until he has a dilapidated appearance. Such a bird is unfit for breeding purposes.

lacerate the flesh in treading them. It is best to take a fine tooth saw or a sharp pruning shear and remove the spur. Dehorn the male by sawing or cutting the spur off close to the leg and trim the toe-nail very short on the inner toes.

## SELECT YOUR BREEDERS DURING THE GROWING PERIOD

There is no better time to select and mark your future breeders than during the growing period. In order to build on a solid foundation it is necessary that your flock has coursing through its veins every evidence of constitutional vigor. There is no better time to select for this important characteristic than during the developing period. You are then in constant touch with your chicks and you can select here and there a few cockerels and pullets that seem to feather more quickly, develop more rapidly, which appear more alert and vigorous and which make better use of their food than the remainder of the chicks in the flock. A few chickens at the head of your breeding pens that have been free from diseases all of their lives and which have always borne evidences of constitutional vigor will go a long ways toward insuring your success.

## RAISING THE PARENT STOCK

We tried out two hatches with one hundred eggs each, one hundred eggs from a farm flock where the farmer was using hens as breeders; hens which had been fed a ration to produce bone and muscle instead of fat; hens which had been raised and kept in open-air houses and given abundant exercise; hens which had been bred for strength and vigor as well as for feathers. The other hundred was from a breeder whom we knew was confining his birds in close cramped quarters; his birds consisted largely of pullets; they had been inbred and raised for exhibition purposes; they were not properly cared for; they were low in vitality; had not had sufficient exercise, pure air or green food. Both sittings of eggs hatched at the same time and were put in the same kind of coops, were fed the same kind of feed, and kept side by side. We never had a single case of bowel trouble or lost a single chick from those hatched from the hens from the farm flock, and the chicks outgrew the others by long odds. The chicks from the pullets and hens which had not been properly bred or kept, died like flies, had diarrhea, and we had to fight to save any of them and those which did live were runty and weakly. If you want your eggs to hatch when placed under a hen or in an incubator and the chicks to come out "like corn popping," you must give the parent stock the proper care and see they were properly raised.

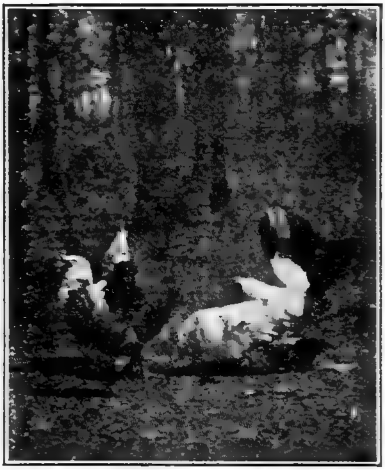


Fig. 12. This shows a number of mature cockerels kept in a pen to themselves. It illustrates how they will abuse themselves if confined. They killed a number of birds in this pen by treading and chasing them, and they are now assembled about a dead bird and treading one which they have killed.

## CONDITION OF PARENT STOCK

A machine which is out of condition will never do good work. A horse out of condition will never win the race. A man who is continually out of condition will never make as great a success as he otherwise would. A show bird out of condition does not stand much chance of the blue in a show room. Neither will a young chick out of condition, as frail and tender as they naturally are, ever stand a reasonable chance of living and developing into a profitable fowl. The condition of the parent stock is largely, and we came near saying almost wholly, responsible for the condition of the baby chick. A chick "well hatched" is half raised. It never pays a farmer to sow poor seed. But it is a much worse practice for the poultryman to breed from poor stock than for a farmer to sow poor seed.

We are often inclined to blame our incubators for things which should be charged to the breeding stock. When chicks die in the shell, when we get poor hatches, when they die in large numbers when a week or two weeks old, we are apt to lay most of the blame upon the incubator or faulty incubation. The incubators are often to blame for some of our troubles, but it is more often some fault with the breeding stock. Lack of vitality, overly fat, not enough exercise, improper feeding, poor housing, immature breeding stock, too close inbreeding, diseased specimens in the pen, or some other fault or condition in the breeding yard, is largely responsible for the poor health of the baby chicks, as a rule. Good, strong, vigorous males and females, properly mated, will store so much vitality in the egg that the embryo can stand a lot of abuse in incubation and the baby chick will overcome and outlive many of our mistakes in faulty breeding and improper feeding.

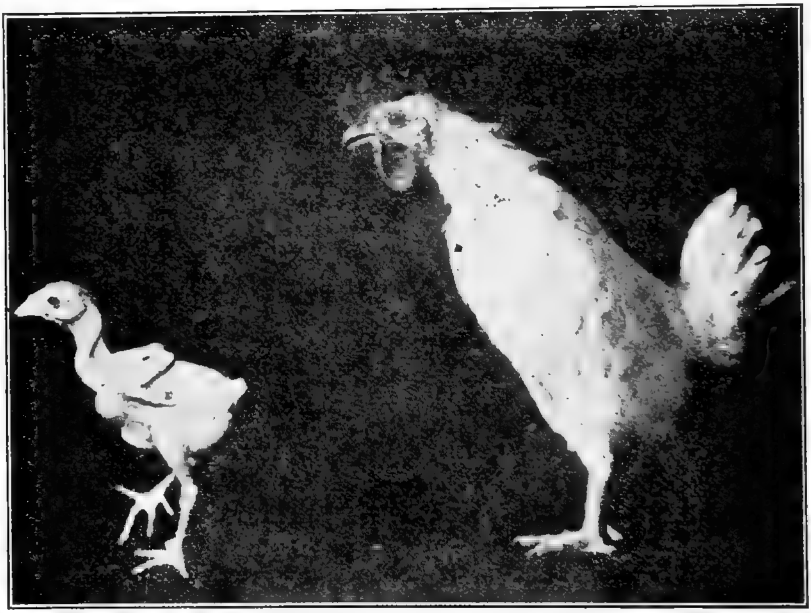


Fig. 14. On the left is shown a cockerel two months old. The bird is small, of low vitality and featherless. On the right is a cockerel only seven weeks old. This bird is crowing, comb is large, bird is full of vigor and is well feathered. The bird on the left was hatched from a poor layer—an immature pullet. The one on the right was hatched from a high layer, which was mature.

## DEFECTS TO BE AVOIDED IN PARENT STOCK

Any bird showing any symptoms of any unsoundness, disease or physical weakness should be discarded from the breeding pen. Do not breed from birds with wry tails, stubs in the legs, down between the toes, side sprig on the comb or other defects which would disqualify. The plumage should appear smooth and brilliant, and the bird should present an active and businesslike appearance. Avoid crooked breast bones, knock-knees, thin shanks and long toe-nails. Do not breed from a bird that is inclined to become overly fat. Never use a male or female which has been seriously sick with any poultry disease. By looking carefully to the selection of the breeding stock you can avoid most of the troubles which are ordinarily encountered in hatching and raising young chicks.

Between the egg and the growing chick are found more than 50 per cent of the most serious poultry problems. All other problems are more easily controlled. You can thus realize the importance of this lesson.

### NUMBER OF FEMALES TO MATE WITH A MALE

If the breeding stock is penned, we usually use one male to ten females if the variety is Plymouth Rocks, Rhode Island Reds, Wyandottes, Orpingtons, or some similar variety. We can use one Leghorn male with about fifteen females. If the birds are on free range, one male of the larger varieties can be mated with fifteen to twenty females, and one Leghorn will serve twenty-five females. Males vary greatly, and you cannot use as many females with a cock bird as a rule, as you can with a cockerel. We prefer to cross a cock bird on mature pullets and mate a cockerel with hens. It is best to test a few eggs to see what per cent are fertile, and if you find the fertility low it would be best to change males or at least endeavor to remedy the trouble.

### THE EFFECT OF IMMATURE BREEDING STOCK

We know that young and immature pullets lay eggs that are small and, therefore, the young chicks hatched from same are usually smaller and weaker than those hatched from older hens. A number of experiments have been conducted at the West Virginia Experiment Station by Professor Horace Atwood to determine the effect of using immature breeding stock. He made eight comparative tests to determine the effect upon the chicks. White Leghorns were used for this purpose. The mature fowls were mostly three-year-old hens while the young pullets ranged in age from six months to one year. The males in each case were practically the same age as the females. Prof. Atwood in the American Poultry World summarized the results of the eight experiments as follows:

| | Old Fowls | Pullets |
|---|---|---|
| Total number of eggs incubated | 1,094 | 871 |
| Average weight of eggs per 100 | 12.96 lbs. | 11.19 lbs. |
| Total number of chicks | 840 | 591 |
| Per cent hatched of eggs incubated | 76.7 lbs. | 67.8 lbs. |
| Average weight of chicks per hundred when removed from incubator | 8.28 lbs. | 7.12 lbs |
| Average weight of chicks at second weighing per hundred | 29.56 lbs. | 23.0 lbs |
| Total number of recorded deaths | 42 | 85 |
| Per cent of chicks which died until about four weeks of age | 5 | 14 |

"The results of this test clearly show that it is a matter of prime importance to have the breeding stock vigorous and of mature age. The eggs from the young fowls were smaller than the eggs from the old hens. The chicks were smaller when they were hatched, grew more slowly, and more of them died from chick diseases than was the case with chicks hatched from eggs laid by mature fowls.

"Immaturity of breeding stock may be one of the most important factors contributing to the failure of many egg farms, where on account of the fact that pullets usually lay better in winter than old hens, the practice has arisen of selling most of the old stock each summer and breeding the following spring from year old hens. That this is a bad practice there is no doubt, as it tends to reduce the size and vigor of the individuals and paves the way for future trouble with roup or parasitic diseases of the various kinds."

## INCUBATION INFLUENCING VIGOR

"Fowls that have been so heavily fed as to become lazy and inactive, and this condition is often accompanied by an enlargement of the liver, lay eggs not well suited for hatching on account of the low average fertility of the eggs and the weakness of the germs. Usually the chicks from such eggs are weak and unthrifty. The remedy for this condition of the breeding stock is not difficult to discover, but beginners who are striving to hatch out a large number of chicks from a few breeders are very apt to feed so heavily that their birds get too fat and out of condition and then trouble results at once in respect to the vigor of the chicks.

"A strong, vigorous, healthy germ may be so weakened by improper incubation as to hatch into a sickly individual that will never become of any particular value. In artificial incubation it is important to avoid those mistakes which have a tendency to reduce the strength and vigor of the chicks."

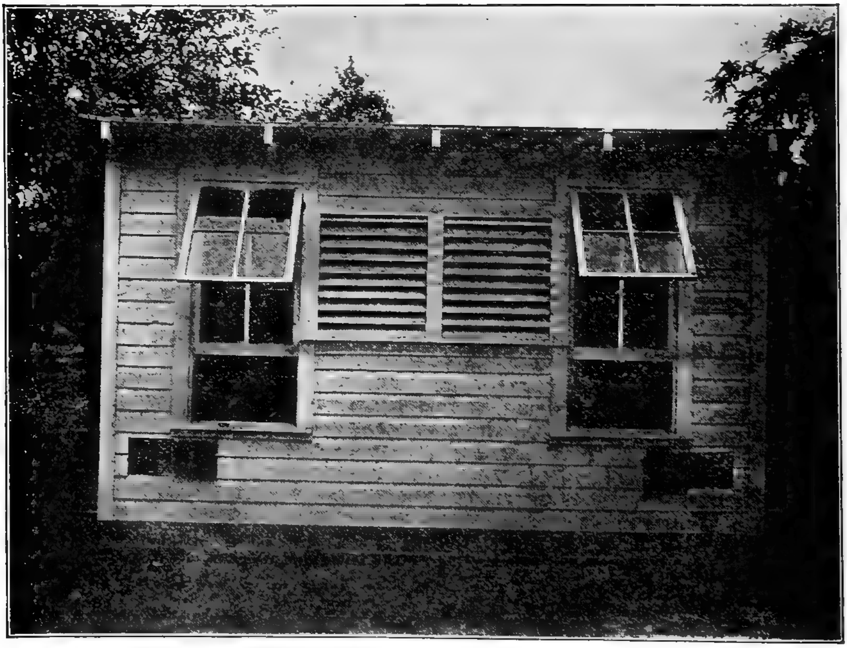


Fig. 17. The design of the "Fool-Proof Poultry House." One similar to this, with a good foundation and built in sections 14 feet square, is well suited for the average climate. We like the "Improved Fool-Proof" type better.

## HOUSING THE BREEDING STOCK

The house need not be elaborate or expensive, but every bird intended for breeding purposes should be comfortably housed. The house should be dry and provision should be made for plenty of sunlight and ventilation. Our "improved fool-proof breeding house" contains all the desirable features of a modern poultry house.

## ALLOW FREE RANGE

We get best results where we allow our breeding stock the liberty of the yard and range every day of the year. They are allowed out at all seasons, hot or cold, wet or dry. In winter they run on ice, eat snow, are out on the frozen ground, will scratch around stacks of straw or shocks of fodder and are continually hustling. They may not lay as many eggs as if they were confined to the house, but they do fertilize their eggs and store vitality in those which are laid. We do not compel them to go out, but they are allowed to if they wish.

## METHODS OF FEEDING AFFECT HATCHES

Laying hens can be fed and should be fed much more freely than those intended for breeding purposes. You should pour the feed into the laying hens or keep it constantly before them, but it is quite different with stock from which you intend to breed. Make the laying hens "lay or bust;" but the breeding stock should be fed only moderately during the breeding season and kept on a bare maintenance ration the remainder of the time. Make them rough it and hustle for all they get. Give them free range and plenty of it. Compel them to exercise and do not feed fattening foods too freely. If mash is fed it should be used only in the afternoon. Do not feed beef scraps or green bone. Give all the green food you can get them to eat. Spade up a few shovels of earth each day for the fowls to work in. After the hens are through the molt we give them plenty to drink, but only a limited supply of food, and compel them to work hard in a deep litter for what they do get. We continue this practice and simply keep them in good condition until the breeding season is about at hand. This gives the egg organs and the digestive organs of the hens a good rest, and when we do begin to increase the ration they respond to it and give us an abundant supply of good eggs, full of meat and vitality. A larger per cent will be fertilized, and the chicks will hatch better and be strong, husky little fellows which live.

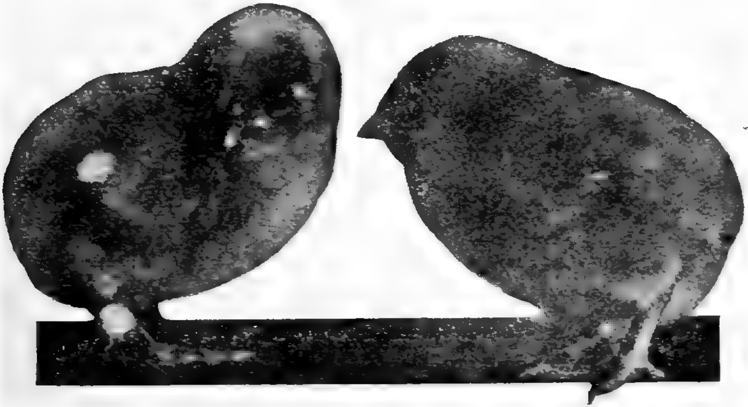


Fig. 19. Hens which are overly fat will not fertilize the eggs so well, neither will the chicks be as strong and vigorous as those where the breeding stock is properly fed.

Heavy laying in the fall and winter is liable to lessen the spring egg yield and lower the vitality of the germs. A breeder of pure-bred poultry who desires to sell eggs for hatching in the spring should not force his hens to lay in fall and winter months.

It is a good idea to force and trap-nest the pullets the first year and not attempt to breed from them. Many evidences of weakness will develop in many of them. Some of the weakest will die. Those which are left are the cream of your flock. You can pick out the pullets which laid best the first year. You can select the pullets which have molted well and held their color, shape and beauty. From such as these you should select your breeders. They have been forced for one year and you know what their record has been. Put the choicest out on range and let them rest and rough it until time to be mated. Just give a bare maintenance ration and from such a bunch of hens you ought to lay a foundation for vitality in your flock which would insure your success in incubation and brooding and in raising the young stock, and in breeding a great flock of layers.

## TRAP-NEST THE BREEDING STOCK

If a farmer has one hundred hens, he should build him a separate breeding pen, large enough to hold ten or twelve birds. He should cull his flock and put the very best ten females and the very best male bird he has on the farm in this pen. In this way he is breeding from the best on the farm and setting eggs from these birds and not breeding promiscuously from anything and everything, the good and bad as well. In this breeding pen he should have four or five trap-nests. These trap-nests will reveal wonders. He will find there are hens among the ten which lay practically every day. He will discover other hens which lay only once or twice a week; still others which are simply deadbeats or boarders on his hands; others which lay poorly shaped eggs with defective shells; others which lay infertile eggs; others whose chicks do not get out of the shell; others whose chicks are weak and sickly; and others which fertilize each egg and the chicks develop into strong, healthy youngsters. With trap-nests and by hatching chicks from the best laying hens, and hens which transmit their vigor, beauty and good qualities to their offspring, he can soon build up a good strain of beautiful, vigorous fowls which will fill the egg basket and yield a handsome profit each year.

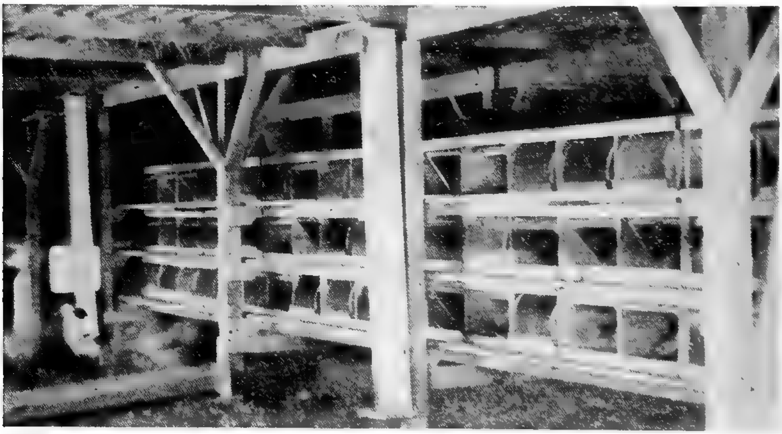


Fig. 21. Trap-nests reveal mysteries and secrets. This shows the nests ready to receive the layers.

## CARE OF EGGS FOR HATCHING

Do not hold eggs longer than two weeks for hatching. However, cases are on record where eggs three months old hatched and the chicks lived. Every day the egg is held it deteriorates, it loses some of its hatching qualities, and the germ loses in vitality.

Keep the eggs in a cool, dry place, and if they are to be kept for a longer period than a week, turn them once a day.

The best temperature to keep eggs for hatching is from 50 to 60 degrees Fahrenheit.

Do not use eggs that are excessively soiled with either mud or droppings or badly smeared with a broken egg.

Disinfect the incubator thoroughly before any eggs are placed in it.

It is impossible to tell the fertility of an egg before incubation.

Avoid rough handling of eggs. If they are badly shaken it will result in a poor hatch.

## THE SELECTION OF EGGS FOR HATCHING

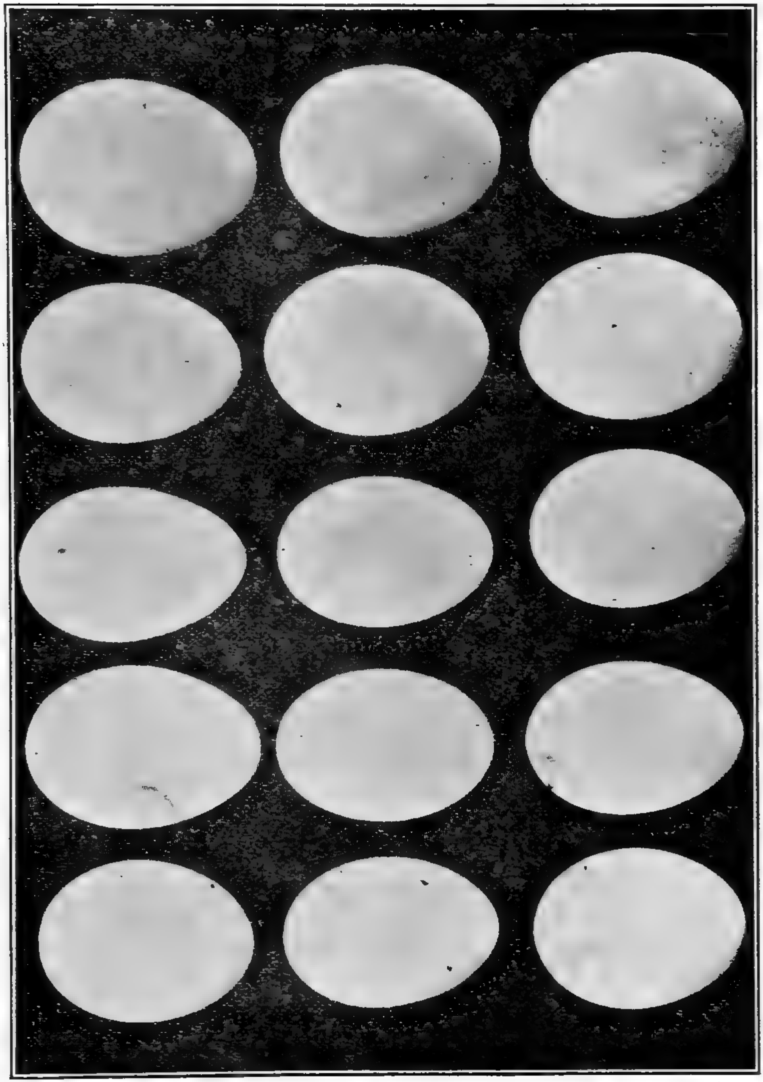


Fig. 22. This illustrates a reasonably good sitting of eggs. They are reasonably uniform in size, shape and color and all have good, firm, smooth shells.

Gather the eggs often in cold weather to prevent chilling, and gather often in hot weather to prevent germ development.

Many eggs for hatching will be ruined if kept in a warm room where the temperature is between 70 and 85 degrees. Keep them where the air is cool, dry and sweet.

The fresher the egg the larger the per cent that will hatch, and the more vigorous will be the chick.

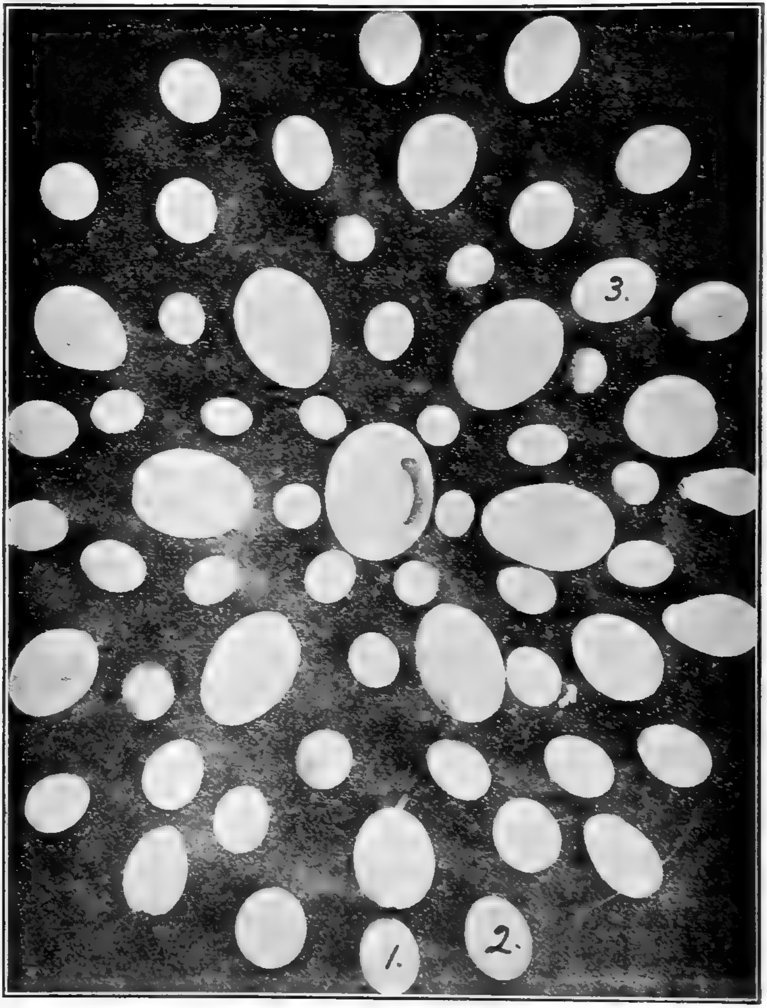


Fig. 23. This is a collection of eggs laid by hens of normal size and in apparently normal condition. Here we have very small eggs, overly large eggs, double yolked eggs, eggs without any yolk at all, rough shelled eggs, soft shelled eggs, long eggs, round eggs, and the egg in the center has another egg of normal size inside of it with shell, white and yolk complete. Inside the shell of the extra large egg was another white and yolk. Eggs 1, 2 and 3 are normal eggs. Very few in the entire collection are suitable for hatching purposes.

It is a serious and costly mistake to take eggs for hatching just as they come from the average flock. On every farm where there is a desire to increase the quality and the uniformity of the eggs there should be a carefully selected breeding pen from which all eggs for hatching should be taken. Many fanciers, simply because a hen won first prize in some poultry show, will use misshaped, thin shelled, and very much undersized eggs that are greatly off in color, or otherwise defective. In attempting to breed to improve the uniformity of color and shape of eggs from any flock, we advise the selection of eggs for incubation of only the kind which you wish to produce. If you want dead white eggs, do not incubate any kind that are tinted in the least. If you want a pure uniform brown egg, then select only that kind. See that none of them weigh less than two ounces and are of the perfect shape which you desire and all of sound, smooth shell.

Use males for mating with these selected hens that were hatched from eggs of the same kind. Use the same process of selecting the following year, and in a few generations you will find that the number of eggs which will have to be culled out will grow gradually less and less. A much larger per cent of eggs will grade "Extras" and "Firsts."

## FRESH EGGS ARE ALWAYS BEST FOR HATCHING

Mr. M. J. Wysocki, a poultry expert, says:

"Following the advent of laying, evaporation of the moisture contents of the egg begins at once and progresses steadily in proportion to the temperature at which the egg is kept. Air enters the egg through the pores of the shell at the same rate the water is leaving by evaporation. Water being nearly eight hundred times heavier than air, it is evident that both the actual weight and the specific gravity of the eggs are becoming less with each succeeding day, while the contents are becoming more and more concentrated and limp, owing to the fact that the inner structure becomes gradually disorganized much the same as that of a wilting flower or plant until it becomes unfit to support the network of veins and the resulting structure in the development of the chick. The contents of eggs that have lost a good part of their natural moisture, and that are to serve as the material for the development of chicks, have become too concentrated for the early and most delicate state of the process. If such eggs are used for incubation, artificial moisture must be supplied which cannot replace the moisture they have lost and the results will never be as satisfactory as from fresh eggs."

The fresh egg when broken into a saucer will have albumen that will appear firm and the yolk will stand up. The egg will produce a

Fig. 24. This cockerel was the first to crow and this pullet the first to lay out of a flock of 200 Barred Plymouth Rocks. If you can't use trap nests and will use this method of selecting your breeders, year after year, you can increase the egg yield considerably. You can well afford to give some attention to such things as this. The reason many flocks of Barred Rocks (and the same applies to all other varieties) do not lay is because no attention is paid to such things as this, nor to selection and to breeding. Anything which is worth doing at all is worth giving some thought and is worth going to some trouble if necessary.

strong chick that is easy to raise. If the albumen is thin and watery and the yolk flattens out in the saucer it will require a lot of skill and patience in feeding and rearing the young chick, even if the egg hatches at all. It is difficult for a poultryman to overcome the elements which are lacking in an egg at the time it is laid or at the time it goes into the incubator.

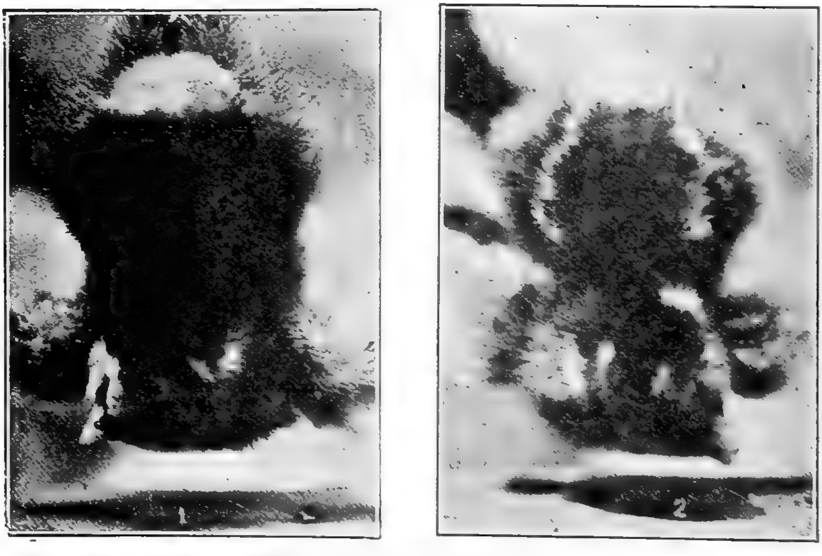
## DETERMINING THE SEX OF AN EGG

Mrs. Noda Fry of Missouri has published a book on determining the sex of an egg before incubation. It has some virtue, but her method is not perfected. Some claim if you mate a strong, active cockerel with hens that are two to five years old, using about five or ten hens with one male bird, you will hatch from 60 to 90 per cent cockerels. To raise nearly all pullets, use an old male bird with twenty-five or thirty-five good pullets. You may not have the highest average fertility, but the chicks hatched will run largely to pullets. Our experience has been that there is not much dependence to these rules. You will get best results if these birds are allowed to have free range.

Some people imagine that by setting round eggs, or those nearly so, they will hatch a larger per cent of pullets. Also, that by incubating only the extra long eggs with wrinkles on the small end of the eggs, that these will hatch cockerels largely. There is no foundation for such a belief. Many fake plans and devices are proposed which are claimed to control sex, influence the hatch and do many other wondrous things. We know that some families in the human race are prone to produce offspring of only one sex. The same is true with your poultry. If you find a male bird or a mating which is inclined to produce a large per cent of the sex you desire, it is advisable to continue this mating as long as the results are satisfactory.

In speaking of this same subject, M. K. Boyer had this to say:

"Referring to the theory that eggs wrinkled at the narrow ends pro-



Photographs No. 1 and No. 2 show distinctly that the male Silver Wyandotte chick carries more white than the female and usually a distinct stripe on the back. It is interesting to note that chick No. 1 also has a very narrow or small comb, while No. 2 has a comb that measured actually but little less than 3-16 of an inch wide. It is also considerably higher or fuller than that of No. 1.

These pictures were taken for the Reliable Poultry Journal, in such a position as to make plain the difference in shape of comb and the actual size of the comb. These pictures also indicate that the male head is considerably coarser in every way.

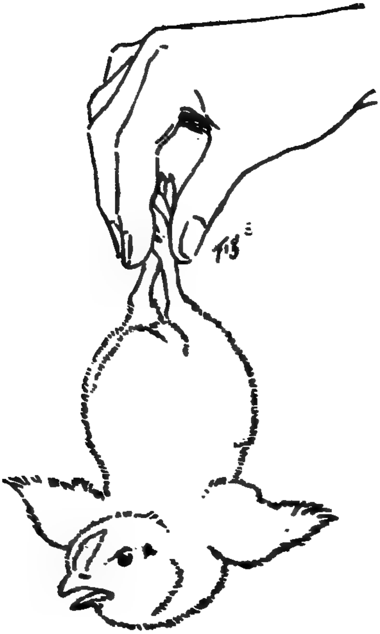


FIGURE 3

**Figs. 3 and 4 illustrate a method of distinguishing the sex of chicks of any breed.**

**Fig. 3. shows a male cock according to the claims of one informant. The chick hangs limp and does not struggle like the female if held in the same way.**

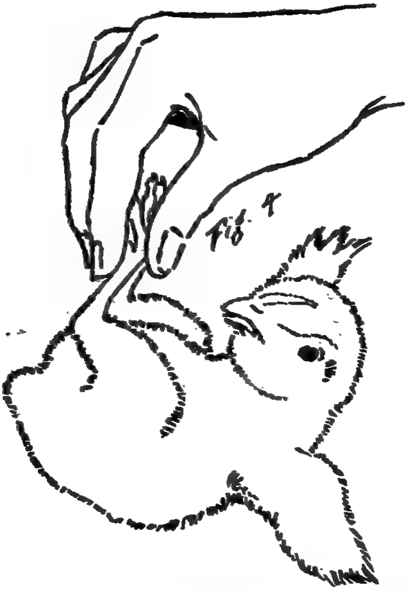


**Fig. 4. While the male chick, if grasped by its feet and held suspended will hang limp or extended as in Fig. 3, the female chick will flutter and draw itself up as in Fig. 4. This method appears to be successful and is worth trying.**

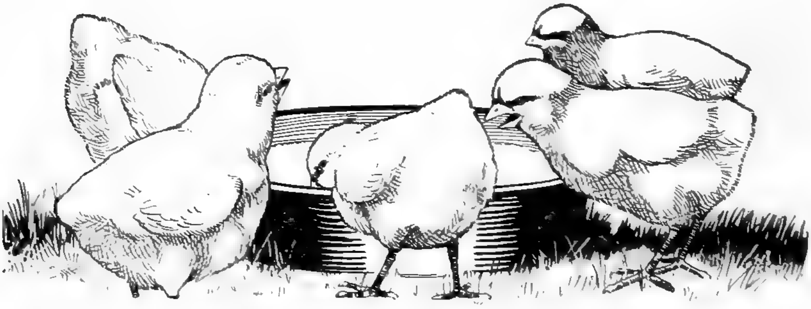
duce cockerels, an English writer says that to the student of embryology this fallacy is at once apparent. For the first few days the chicken is sexual, from then to about the seventh day it is distinctly hermaphrodite, and contains within itself the elements of both sexes. After this stage it diverges in one direction, one set of organs developing and the other dimishing, according to whether the germ is going to produce a male or female. So that if the germ had a living consciousness it would not know at the sixth day which sex it would ultimately be."

## TELLING THE SEX OF DAY-OLD CHICKS

There is no doubt about most parti-colored chickens having some color distinction, which if the breeder observes closely, will be a fairly reliable guide in the selection of the male and female at the time the chicks are hatched. But in the case of white and solid colored varieties it is difficult to formulate any rule or method which would be anything like correct. In the selection of Barred Rocks, Silver Wyandottes and such varieties, the male chicks are always lighter in color than the females. The males have combs, which are wider at the base and the leg color of the female is much darker than that of a male chick, as a rule. The legs of the male chick of most varieties are usually a trifle larger and plumper than those of the female. The male chicks almost invariably show more white or grey. The male head is usually considerably coarser. There is no rule which is invariably correct, but these suggestions may prove helpful if the breeder is a close observer."

Mr. W. L. Fry has given considerable study to the question and he states:

"By far the most surprising and interesting theory is one which was first brought to my attention last August. The poultryman wrote: 'My method in telling the sex of day-old chicks is to take the chick by the back of the neck with two fingers and hold it up. A male chick, any breed, will drop its legs and a female will draw them up close to the body.' This seemed so ridiculously easy, almost primitive—that I at once began to make tests and I have been genuinely surprised with the success of this simple method, for it seemed to 'prove up' in a great majority of cases. However, I found it better and surer to grasp the chick by the feet and let it hang down. The male chick will hang limp or extended, while the female chick will struggle and draw the head and body up toward the feet. I tried to photograph some chicks to illustrate this but the films were not good. However, the outline sketches illustrated herewith, show the method plainly. The man who showed me this method said he used it successfully. My own tests of it this season have failed in only one case out of over thirty chicks under observation. It is a method that requires only an instant of time and no great knowledge or skill. If it works correctly with even 75 per cent of the chicks it is valuable, because the novice can use it as well as the more experienced breeder and it will work as well with one breed as another. Such a



Milk, either sweet or sour, fed to the youngsters hastens growth and development. Whichever you use, stick to that kind. Don't use sweet milk one day and sour the next.

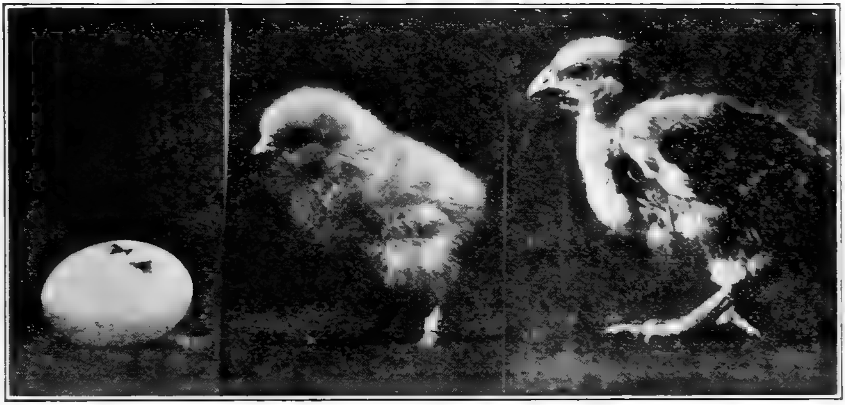
method with the added 'check' of comb, leg and head conformation and the color distinction ought to enable anyone to tell the sex of day-old chicks successfully."

### CHICKS HATCHED IN THE SUMMER

We often hear it said that June hatched chicks will not live. They appear drowsy and sleep themselves to death. We do not think that this sleepiness is due to the month in which the chicks were hatched, but is due to the fact that the breeding stock has no doubt been laying heavily during the early spring months and by the time the months of June and July arrive they are lower in vitality, the eggs are somewhat smaller, and it is impossible for them to store the vitality in the egg that is really required. The hot summer sun is now drying up vegetation, lice and mites are getting started, and worms and insects are not as plentiful as they were earlier in the summer and as they are later in the fall. The hot, sultry days of June and July are trying on the life of the tiny and newly hatched chick. Chicks hatched in August, September and October usually do better in many climates than do those that are hatched in the months of June and July.

### DRY WEATHER HARD ON CHICKS

A hot summer, especially one that is dry, is very trying on young chicks. Though a summer may be hot, if we have occasional rains, the chicks will grow faster and do much better than they will during a season when the weather is both hot and extremely dry. Plenty of shade, pure water and succulent green food must be provided in such a season.



From the shell to a point beyond the danger line. Correct breeding and care will insure a large per cent hatch. Correct brooding and feeding will result in quick growth. The above shows the egg hatching, the baby chick right after he was out of shell and dry, and the growing chick when two weeks old, showing the different stages of development.

### FALL HATCHED CHICKS

Chicks that are hatched in the fell seem to grow more rapidly and do better than those hatched during the hot days of summer. The weather is still pleasantly warm and vegetation is just getting a fresh start following the first fall rains, thus affording the necessary succulent green food.

The chicks develop and before the cold days of winter they are fully feathered and well grown. Vermin is more easily handled at that season of the year and there is nothing to retard the growth of the young chicks.

By early spring these fall hatched pullets are six or seven months old and are fully matured and ready for laying. These fall hatched pullets lay, as a rule, throughout the summer and seldom moult until late the next fall. We believe that it is advisable for every poultryman to hatch at least a few fall chicks. This affords an opportunity for fall and winter broilers and the fall hatched pullets fill in at a season when the older pullets and hens are not bringing in any returns. By hatching a few chicks each fall it enables you to use your equipment for incubation and brooding throughout the year, which would otherwise be idle a greater portion of the time.

## THE DAY-OLD CHICK BUSINESS

The selling of day-old chicks has grown to be an important branch of the poultry business. We know of single incubators, which have a capacity of a quarter of a million eggs at one hatching. We know of a number of hatcheries that have built up an immense and profitable business in this branch of the industry.

Chicks should never be shipped where the distance requires longer than two days for the chicks to be delivered from the time they are taken from the incubator. Immediately after the chicks are removed from the machine is the period in life when nature intended that the chicks should be without food, and for that reason chicks can be sent long distances without danger or discomfort. The only problem is to see that the little chicks are so packed that the natural heat of their bodies will be retained. One of the best packages yet manufactured is a simple corrugated fibre board box. The lightness in weight saves express charges and the construction of the fibre board box protects them from cold. Holes should be cut in the side of the box for ventilation. These boxes can be purchased in sizes that hold 25, 50 and 100 chicks each. The small boxes have only one compartment, the fifty size have two compartments and the one hundred size has four compartments. It is not advisable to ship more than twenty-five chicks in one compartment. It is best to put some rough material in the bottom of the box, so as to give the little chicks a foothold. For this purpose we usually use bran, feather, alfalfa meal, finely cut straw or excelsior. Excelsior is perhaps the best.

There is no doubt about the future of this branch of the poultry industry. We believe that the large hatcheries will increase in number rather than diminish as the industry develops in this country.

One thing we would like to caution all our students about, and that is if you are selling chicks to any customer you should urge them to have their brooding device all ready for the little chicks when they arrive. You should also notify them at the time of shipment, so that they can call at the express office and be on the lookout so as to insure prompt delivery. In hot weather do not expose them to the sun; in cold weather something should be taken along, so as to cover the shipment and protect the chicks. As soon as they arrive they should be allowed to warm up a little, and they should then be given some water, sour milk, or buttermilk, but do not allow them to drink too freely. Begin to feed as we recommend and feed only small quantities at a time. You will find that this branch of your work is very profitable if properly done, and even though you are raising only a small number of chickens we would advise you to advertise baby chicks for sale, as well as hatching eggs, market eggs and breeding stock.

## HATCH EARLY

Not only should you give much attention to the selection of the breeding stock, but the matings should also be made early. One early hatched chick is worth three late hatched ones, we care not for what purpose it is intended. The early chicks come from your best winter layers. They seem to have the most vitality and are the easiest raised, as a rule. If you are in the fancy business, you want a few early pullets and cockerels for your county fair and state fairs. Most of the big breeders of the country make their best, quickest and easiest money from selling early birds to people to exhibit at the summer and fall fairs. They have them when the other fellow hasn't them, and therefore get the price. Later on in the season everybody has mature chickens, and everybody has them for sale. Also the early-maturing pullets are the fall and winter layers when market eggs are highest. The early hatched chickens are those which are raised to maturity at the least cost. They make the best capons. They are better in every way. The fact that some farmers and poultry raisers never hatch chicks until late is responsible for many failures. If you are not fixed to hatch and brood chicks in February, March and April, you had better get the equipment necessary to do so if you wish to make the greatest possible profit. In the southern states they can be hatched earlier than this. Do not hatch all of your chicks early, but by all means, hatch at least a portion of your chicks early.

A pullet which does not begin to lay before the winter season will more than likely not start before spring. Such pullets are a dead loss for several months. The margin of profit in the poultry business will not stand such a loss. The Leghorn pullets will begin to lay, as a rule, in from four and one-half to nine months, depending upon how they are bred and how managed during growth. The American, English and such breeds will begin to lay in from four and one-half to eleven months.

## THE INCUBATOR

Incubators are to blame for many things very often, as the market is flooded with machines which are not properly built or scientifically constructed. But the best incubator manufactured will not make an infertile egg fertile, neither will it make a weak germed egg hatch. Before the real hatching season comes on, it is always a good idea to make a trial hatch from each of your pens. The eggs may not be fertilized. You may have made a poor mating, or you may be obliged to change males in some of your pens. Do not take chances, but test out your matings before the hatching season is actually upon you.

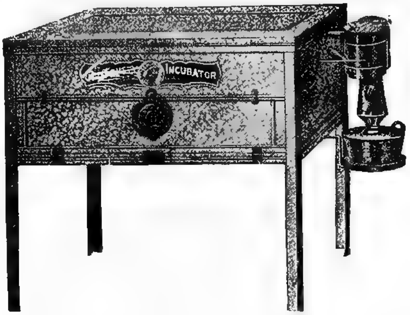


Fig. 26. The incubator is not responsible for all the poor hatches which are reported, not by a great deal. The best incubators on the market today, and there are quite a number of them, will hatch just as many eggs and just as strong chicks as the average farm hen. There are a lot of incubators made which are simply made to sell and are not dependable.

## ELIMINATE DRONES AT HATCHING TIME

From what experience we have had, from what tests we have made and from what experiments we have conducted, we feel safe in saying that the first half of the chickens which hatch in an incubator contain 90 per cent of the profit makers in that hatch. Ninety per cent of the last half of the chicks hatched will lose you money if kept to maturity. Our experience has been that the first ones hatched mature quicker; grow more rapidly; lay first; lay most eggs; make the best use of their feed, and are more robust and healthy. The last half hatched contains most of the chicks lowest in vitality and those which are a menace to your flock. You will find most of the unprofitable ones in the last half or the eggs which hatch in any sitting. A very small per cent of the last half of any hatch will ever pay you to keep beyond the broiler or frying age. If you can mark them and thus dispose of the tail ender you will be breeding from the very best in your flock and will soon have a flock that is full of pep, vitality and profit making ability.

The fact that a chick grows rapidly in the shell and makes good use of the food which nature has placed there for its use during the first 20 days of its growth and development and then hatches and beats another chick out of the shell from 6 to 24 hours is an almost sure sign that the first will beat the last in the race of life and at every stage of its existence. There are exceptions, but this is the rule. Mark the first one-third or one-half of your chicks that hatch and try this out. It is an almost certain indicator of the profitable and unprofitable chicks. If you have to raise and carry half of your flock at a loss, you can readily see what a saving could be made by this plan.

## THE CONSTRUCTION AND FORMATION OF AN EGG AND THE PROCESS OF FERTILIZATION

The construction of the ordinary egg, its formation, and the process of fertilization is really an interesting and wonderful study. Nearly all animal life comes from eggs of some form. In some animals, as in man, months are required for the egg to become fully developed within the body of the female parent, and by her to then give birth to a living, active being. The same is true with domestic animals. But with the hen the egg is rapidly developed within the body, a shell is placed on the outside as a covering and a protection, and the egg is laid or deposited by the mother, and she afterwards incubates it by sitting on the eggs for three weeks and allowing the eggs to come in contact with her own body heat, or man, by artificial means, furnishes the heat and incubates the eggs, so that the young life within the egg grows and develops and is enabled to work its own way from the shell, and birth is given in that way.

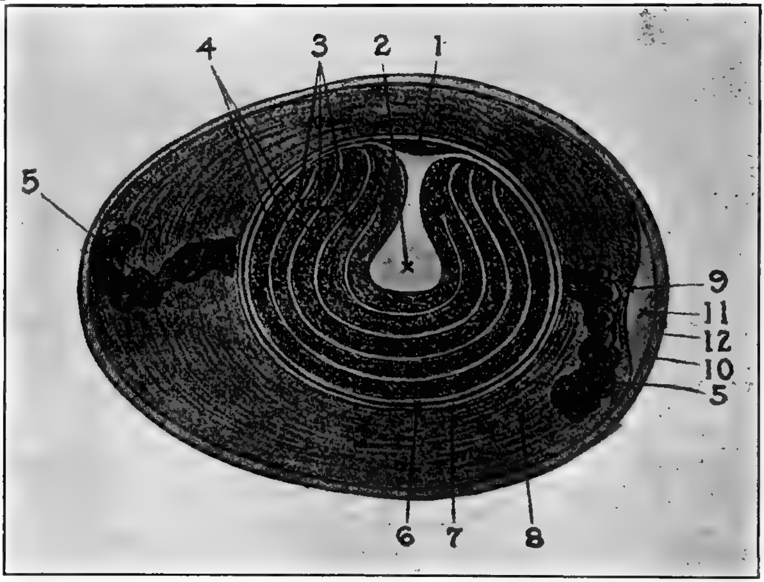


Fig. 27. The diagram of a cross section of the egg taken lengthwise. 1. Germinal disc. 2. Central white yolk. 3. Concentrated white layers surrounding the yellow yolk. 4. Yellow yolk. 5. Chalazae. 6. Vitelline membrane. 7. A thick albuminous layer which envelops the yolk. 8. The albumen. 9. Interior shell membrane. 10. Exterior shell membrane. 11. Air chamber. 12. Shell.

Before we proceed with a discussion of this subject we think it best to give a sort of glossary or definition of the various terms used in the discussion so that it may be clearly understood and so that we may see everything from the same viewpoint.

**Ovary**—The female reproductive organ in which the ova or yolks are produced. This term is used to refer to the entire collection of yolks, ova or ovules.

**Ovules**—The dormant and developing yolks found in grape-like clusters in the ovary.

**Ovum** (plural), **Ova**, or **Yolks.**—The female cell, or true egg, which when fertilized by the male germ develops into a living being.

**Oviduct**—A tube like organ for the passage of the yolk from the ovary to the exterior of the bird, and in which albumen, shell, and other parts of an egg are secreted and developed.

**Yolk**—The sphere of yellowish material found in the center of an egg. Until it is fully developed and released from the ovary the yolk is known by the term ovule or ovum.

**Follicle**—The sac or membrane containing or surrounding the ovule before it leaves the ovary.

**Stigma**—That portion of the follicle which is thinnest and contains no blood vessels and which, when the ovule is fully developed, breaks to permit it to pass into the oviduct.

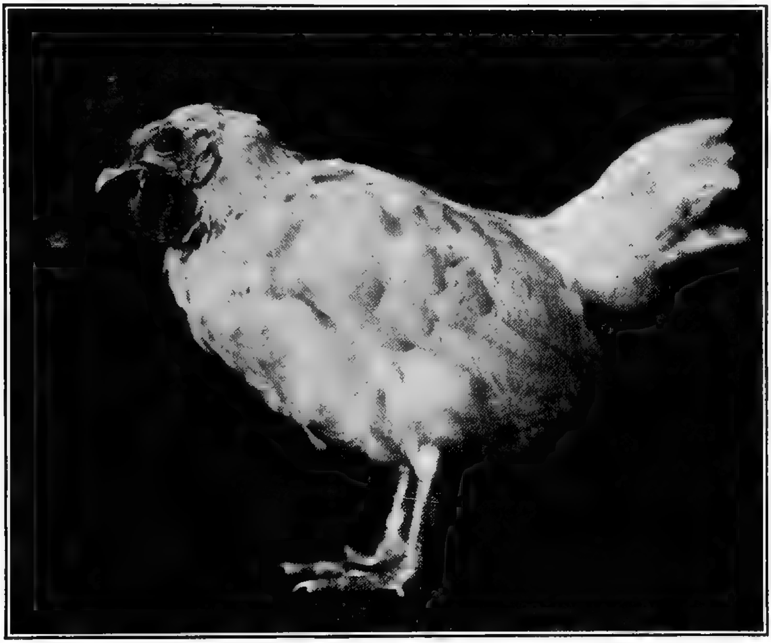


Fig. 25. This cockerel is two days more than seven weeks old. He shows unusual development for a bird so young. He had been crowing for a week and was the youngest from a hatch of 5,000 chicks to crow. He was the result of breeding for egg production, and was bred from a cross of the best egg producers we could get in England, Australia and America. In some countries trap nests are not used, but the native poultry raisers breed up good flocks of layers by breeding from the cockerels which crow first and from the pullets which mature and lay first. The fact that this cockerel crowed so early, developed so rapidly and began to tread pullets when seven weeks old is some evidence that he would be a valuable breeder as far as egg production is concerned.

**Germinal Disc, Nucleus, or Female Germ**—The white circular spot usually found on the top side of the yolk, which, when the male germ has united with it, the life of the chick begins.

**Ovisac or Vitelline Membrane**—The thin transparent membrane surrounding the yolk of an egg.

**Semen**—The whitish fluid deposited by the male and which contains the germs from the testicles. The semen contains the spermatozoa or male germ.

**Germ or Germ Cell**—The smallest living organism. The cell from which a chick gets its beginning. At one time a part of the body of the parent, it finally becomes detached and by the process of multiplication and growth gives rise to a mass of new cells, which ultimately form a new individual much like and after the form of the parent.

**Embryo**—An unhatched chick in any stage of development.

**Chalaza**—A thickened sac of albuminous substance surrounding the yolk with each end twisted into spiral cords extending out into the albumen at each end of the egg. This serves to maintain the position of the yolk in the center of the egg.

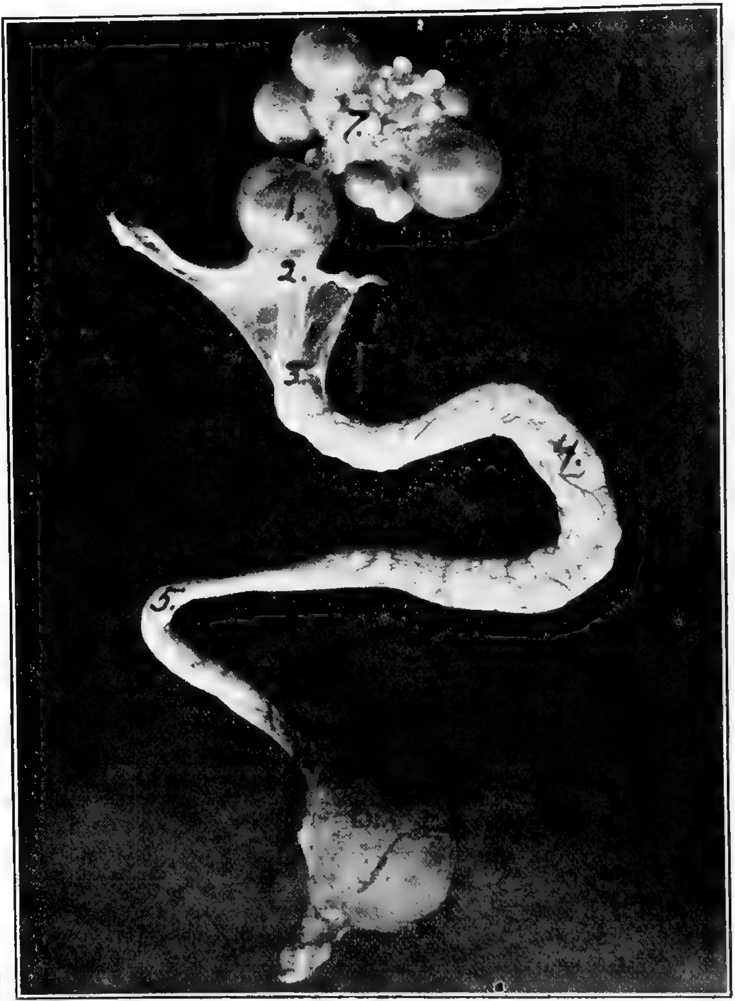


Fig. 28. This illustrates healthy egg organs. 1. Yolk ready to pass into the oviduct. 2. Mouth of the oviduct. 3. Portion of the oviduct where the chalazae is placed about the yolk and twisted. 4. Albumen secreting section of the oviduct. 5. The portion of the oviduct where the shell membrane is formed and placed about the egg. 6. The shell is being formed just before the egg is laid. This shows a full sized egg on the inside of the oviduct, nearly ready to be laid. 7. The ovary of a hen with ovum of all sizes. This oviduct has the appearance of being small and stringy. This is because of the fact that this oviduct has just emptied its contents in creating the chalazae, the albumen, the membrane and the shell. These have all been placed about the egg (6). This reduced the thickness and fullness of the oviduct. The body will now begin to store in the glands and within the walls of the oviduct another supply of chalazae, albumen and material for the making of membranes and shell for the next egg to follow. When the walls and glands of the oviduct are so filled, it will appear much thicker, shorter and heavier until it is again emptied.

**Albumen**—A thick, viscous nitrogenous substance, which is transparent and is the chief and characteristic constituent of the white of eggs.

**Shell**—The hard, porous outside covering of the eggs. Porous to admit air to the developing embryo and hard to afford protection to same.

**Shell Membrane**—There are two of these, exterior and interior. The exterior membrane lines the shell, and the interior membrane is next to that and covers the albumen or white.

**Air Chamber**—The exterior and interior shell membranes separate when evaporation takes place in the egg and leaves a vacancy or air space, usually found in the large end of the egg.

## THE GROWTH AND FORMATION OF AN EGG

There are hundreds and thousands of tiny ovules to be found in the ovary of practically every hen. A large portion of these are never developed. Those which do not mature are fed and nourished by the hen's system until they become fully developed or ripened. If the hen is properly developed physically; if she is properly fed, housed and cared for; if she is properly bred, she will consume food and keep storing fat and food into the yolk or ovum until it becomes of normal size and is fully matured. In fact, it becomes so full and the tissue or membrane surrounding it—the follicle—becomes so thin that the stigma is ruptured, and this allows the ovum or yolk to drop into the mouth of the oviduct.

Before this ovum left the ovary it contained the female germ or the nucleus or germinal disc, in addition to the yolk contents, and this was all contained in the ovisac or vitelline membrane, and the ovum in its entirety held in place by the follicle. The follicle contained the blood vessels which fed and developed the ovum.

The egg or cell from which a human being is developed is very small as compared with the egg from which the chick is developed. The enormous size of the last mentioned cell is due to the large quantity of nutritive material present, this contributing by far the greater part of the bulk. The germ cell proper or nucleus floats in the germinal disc upon the surface of the cell in its entirety, the yolk or ovum. Why is the ordinary hen egg so much larger than the human egg, or so much larger than the eggs from which our domestic animals are developed? There again is another wise provision of nature. In the human or domestic animals all the germ needs is those things which contribute to its life and growth while in the embryonic stage, for before and after birth the food and nourishment needed to continue growth and development is supplied by the mother. But with the chick it has no connection with its mother, either in the embryonic stage or after birth, so some provision of nature must supply an abundance of rich nitrogenous food to last the chick for some time before and after birth, as it must depend upon its own resources and upon the food contained in the yolk of the egg, for the time being at least. The white or albumen contents and the yolk are for that purpose. Such is the egg as it leaves the hen's body.

If you examine a follicle and find a yellowish white spot devoid of blood-vessels, this is the point where rupture will take place. When this occurs, the yolk is ripe and ready to pass into the oviduct. If the follicle should rupture at some other point than at the stigma, it will likely rupture a blood-vessel and cause a slight hemorrhage. This is responsible for the blood spots found on the yolks of fresh laid eggs.

The white or albumen surrounding the egg proper, also the shell, are simply provided for the protection of the germ cell and to nourish the developing embryo. The embryo appropriates and feeds upon the white as it grows and develops. Just before the chick leaves the shell it draws the yolk into the abdomen, and this is its first supply of food for the first few days after hatching. The first portion of the egg to be developed and the last portion of the egg to be used is the yolk. Thus the first provision of nature is to provide at the very beginning for its need in the end.

## THE PROCESS OF FERTILIZATION

The male treads the hen and deposits the semen in the cloaca. This contains innumerable male germs. At the same time the hen secretes a mucous, and this unites with the semen from the male. The male germs thrive on this, and it enables them to work their way up the oviduct and they are found along the walls of the oviduct and in the body cavity surrounding the ovary. Here they remain and are thought to fertilize the egg as it drops from the follicle into the mouth of the oviduct, which lies immediately beneath the ovary. After the follicle is ruptured the male germ lodges itself in the germinal disc and unites with the female cell, and thus the life of the chick begins. The ovum may be fertilized before it reaches the oviduct, as stated above, or after it passes into the mouth of the oviduct. We have made post-mortem examinations of laying hens and found the mouth of the oviduct clasped about the yolk, ready to receive it as soon as the stigma ruptured. In such cases the fertilization takes place in the mouth of the oviduct, and this is where the cells unite. If the follicle is ruptured and the yolk drops into the oviduct, fertilization may take place before it reaches the oviduct.

The first section of the oviduct through which the yolk passes is where the yolk is covered with the chalazal layer. The yolk revolves on its journey through this portion of the oviduct, and this motion prolongs this layer into a somewhat spirally twisted albuminous substance. These cords act as sort of hammock ropes and extend out into the albumen at each end of the egg for the purpose of maintaining the position of the yolk in the center of the egg.

The yolk then passes through the second section of the oviduct where the albumen is secreted. Thence it goes into the third portion of the oviduct and the shell membranes are placed about the egg, and the final coating or shell is created for the protection of the entire contents. It is then laid. It requires from ten to twenty hours for the average hen to complete an egg after the yolk leaves the ovary. The yolk usually remains in the oviduct about six hours while the albumen is being secreted, and about twelve hours in the shell forming section while the shell is being made. Thus incubation takes place and the embryo is growing and developing before the egg ever leaves the body of the hen.

Enclosing the albumen are two thin, tough shell membranes. These are compactly filled at the time the shell is placed about the egg, but soon after laying, evaporation takes place, and these two layers separate at the large end of the egg, and thus the air chamber is formed.

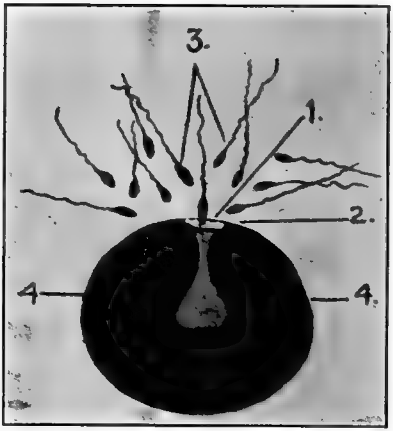


Fig. 29. This figure represents the approach and fusion of the spermatozoa or male germ with the germinal disc on the yolk. The spermatozoa make their way to the ovum and swarm about it as illustrated here. They are much enlarged here compared to the size of the yolk, as they are only visible under the microscope, but this serves the purpose of illustrating the process of fertilization. The spermatozoa, whose head first enters the nucleus, unites with the nucleolus and loses its tail in the process. Then it is that growth and the life of the chicks begins.

1. Nucleolus.
2. Nucleus or germinal disc.
3. Spermatozoa or male germ.
4. Ovum or yolk.

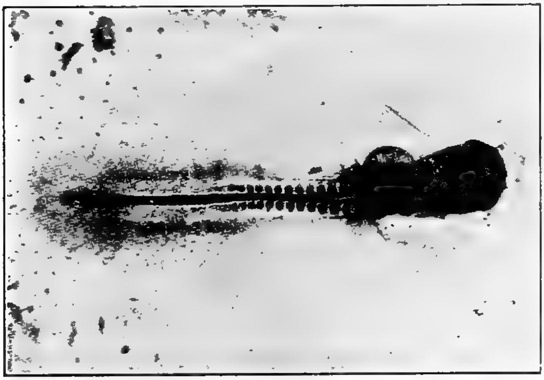
The female germ or ova does not possess the vitality or livability of the male germ. The former will not survive longer than seven to nine days unless it is impregnated by the male germ. The male germ shows remarkable vitality and lives for about three times as long as the female germ. After fertilization takes place one of the remarkable things about a hen's egg is its power to resume growth after it had once stopped development.

## THE GROWTH OF THE EMBRYO

Dr. Brigham has this to say about the growth of the embryo: Neither the white nor yolk furnishes the chicken. If you place an egg on its side and break it open on top, you notice that the yolk comes near the shell and you observe a little white spot, about one-eigth of an inch in diameter, on the yolk. That little white spot contains the germ of life as described above. All else furnishes food for the development of the chick.

As you move the egg slightly to one side before an egg-tester, you notice that the yolk moves. That comes out more conspicuously after the egg has been under the influence of incubation for some time. Turn a white shelled egg sidewise before an egg-tester and you will see that the yolk of the egg moves around when at rest. It always floats on top, because it is the lightest part.

That little white spot contains the germ of the future chick. Place an egg under a hen or in an incubator for twenty-four hours and a wonderful change will take place—the little white spot develops into a number of cells. One cell has divided into two and two have again divided, and so on until we have hundreds of cells formed. Every part of the chicken is made up of these cells. They are compressed and elongated into bone, brain and the beginning of feathers. If, after twenty-four hours, you hold the egg up before the light, you will notice that there is a rosy circle about the size of a dime at the top of the yolk. The rosy tint is due to the blood-vessels formed there. If you look again at the egg after another twenty-four hours, you will notice that the circle has increased to the size of a quarter of a dollar. By the end of the third day it will have increased to the size of a half dollar, and so un, until it completely surrounds the yolk. That system of blood-vessels is for the purpose of gathering food for the chick. By the end of the fifth day, if you hold up a good, fertile egg before a bright light, you will find that you have a network of veins almost scarlet in tint, and in the center of this network of veins is a clear spot, within which is our embryo chick. You will notice that it looks like a little grub. At one end there is a black spot—this is the eye, perfectly formed, in five days. It is a perfect lens. And other series of veins start out about the fourth day and surround the albumen of the egg—this is for the purpose of

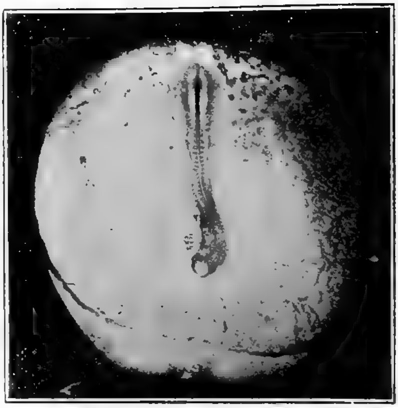


(Courtesy of C. H. Spurgeon, Drury College.)
Fig. 30. An embryo 34 hours old.

gathering food and also to take the place of the lungs, which are not yet formed.

By the seventh day the little fellow becomes very vigorous and active, and instead of remaining quiet he dives about. He is in a swimming bag. The thinnest of albumen surrounds the embryo. The reason he is kept in this bag is that he may not get too much air through the porous shell. By the eleventh day the chick is complete in all its parts. Even the feathers and toes and nails have begun to be formed. Thus we see that in eleven days a miracle, as it were, has been performed in a common hen's egg.

Anyone having fully learned this lesson cannot help being interested in poultry culture. They will learn that eggs are not laid simply to be gulped down by humans. There never was an egg laid for that purpose, but every egg that a hen has laid was produced because she desired to propagate her own kind.

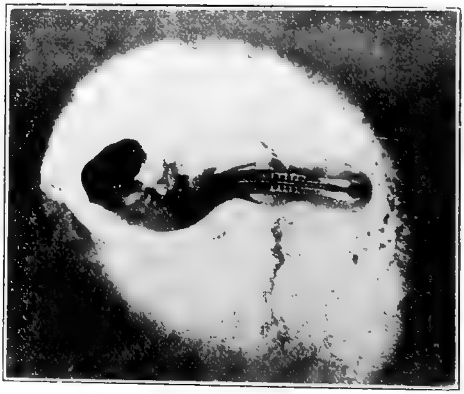


(Courtesy of C. H. Spurgeon, Drury College.)

Fig. 31. An embryo as it appears under the microscope when 42 hours old.

In eleven days the chick is perfectly formed. By this time there comes a great change, for after the thirteenth day the swimming is dispensed with and most of the albumen which it contained has been used. The water in the egg begins to evaporate faster and the air cell increases in size. From the fourteenth to the nineteenth day, animal heat begins to develop to a noticeable degree. The blood is circulating through the chick and the little heart is pulsating. Think of the change from one cell to a perfect chick in nineteen days.

And note the little chick's lungs get into operation—if you hold the egg up to your ear you can hear a little peep. He must have air, but he must get out and get out quickly or there won't be air enough. He is provided with a little instrument, a regular little ice plow on the top of his bill, for breaking through the shell. He works and works until he has made a little hole in the shell through which he breathes. The egg is then said to be "pipped." Then he works his head backwards and strains to burst the shell. Sometimes the shell breaks, but if it does not he works away all around the egg. Sometimes he is held by strings of the inner lining and cannot get out. When the egg is opened, he comes out all slimy and wet, the ugliest little thing you ever saw. However, in fifteen minutes he is dry and fluffy and looking about with bright little eyes. If you tap on the glass door of the egg chamber, he will come toward you.



(Courtesy of C. H. Spurgeon, Drury College.)

Fig. 32. An embryo as it has developed after 48 hours' growth in an incubator.

# LIFE OR DEATH—A CONTINUAL WARFARE

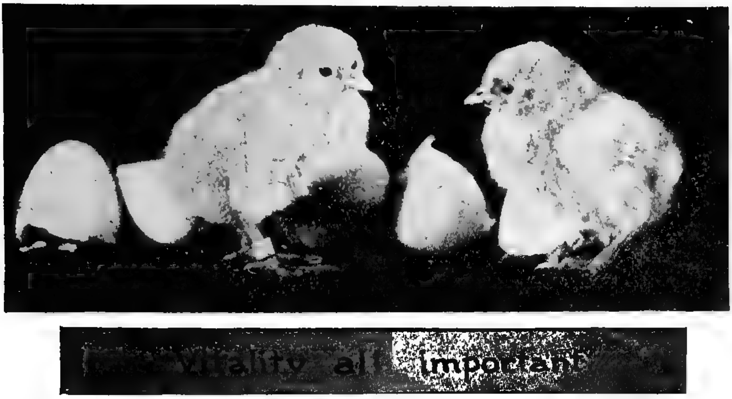


Fig. 33. If the chick has been properly bred, the egg properly handled and properly incubated, and the chick properly brooded and fed, it will naturally be so filled with strength and vigor that it will be able to fight off and withstand the ravages of most diseases. But an error along any one of these lines might cause absolute failure.

The inquisitive little chick which now comes to greet you is a very delicate little creature. In only 21 days a wonderful growth and change has taken place. Three weeks ago it was a fresh egg with no signs of life. Today it is a beautiful, fluffy, living, active little chick—bone, muscle, blood, feathers, sensitive brain, beating heart, and active organs. It would hardly be possible to conceive of a more wonderful and rapid change. Its body is like a little world unto itself, being made up of living cities peopled by myriads of cells, each living and performing its own work. These cells all help to maintain the body. There is a continual struggle going on in the body, a warfare, as it were, between the living cells and various disease germs, the germs attempting to tear down and the cells continually building up and replacing. The digestive organs receive the food and prepare it for the development and maintenance of the body. The arteries are the transportation system for carrying the building material from the digestive organs and lungs, and for carrying the laborers to the various parts of the body. The veins return the waste products to be cast off.

Dr. P. T. Woods makes this very easily understood when he states that these body cells act as a great standing army to beat down the invading army of disease germs. As long as the body is properly housed and fed, as long as these cells are not abused or ill fed, just that long will the chick remain in good health. If the body cells are routed, if they are caused to go on a strike because of mistreatment, then it is that the chicks show signs of ill health and often death results.

## THE BABY CHICK

### Lesson No. 14

1. Why is the baby chick problem one of the most important with any poultryman?

2. Name three of the most important things which should be considered in the selection of breeding stock.

3. In selecting females for breeding purposes, would you select pullets or hens? Why? And what sepcial care should females have that are intended for breeding purposes?

4. Name six of the most serious defects which should be avoided in the parent stock.

5. What difference should be made in methods of feeding breeding stock and laying hens? Why?

6. What methods are sometimes practiced in building up an egg-laying strain without the use of trap-nests?

7. Mention four important things which should be done in caring for eggs for hatching, and what kind of eggs should never be incubated?

8. Name all the parts of a completed egg, and define the purpose of each part.

9. Does fertilization take place before the egg leaves the ovary or afterwards?

10. Does the growth of the chick or embryo begin before the egg leaves the hen's body or after it has been in an incubator or under a hen?

## Lesson 15

## SOME CAUSES FOR INFERTILE EGGS AND DEATH IN THE SHELL

Infertile eggs are responsible for much of the loss at the time of incubation. A great many things may be responsible for the infertility, and the reasons for same can be summed up as follows:

Breeders that are overly fat.
Lack of exercise.
Breeding stock of low vitality.
Insufficient green food.
Extremely old or decrepit breeding stock.
Breeding from birds that are young and immature.
Excess of females to one male.
Lack of proper feed.
Unsanitary quarters.
Use of poorly constructed and poorly ventilated houses.

The death of germs may be caused by:

Keeping eggs at too high a temperature before incubation.
Great variations in temperature.
Low vitality in the breeding stock.
Keeping too long before incubation.
Improper methods of incubation.

Fig. 34. If a poultry raiser cannot hatch on the average one chick for every two eggs set, fertile or infertile, it will pay him better to sell his males and sell his eggs and buy baby chicks hatched by some one else.

Hundreds of people write to know why the chicks die in the shell from the 18th to the 21st day. It may be caused by any of the above, but in our opinion is more generally caused by lack of vitality in the

# TEST NO. 1.

The following shows the band number of each hen. The male was removed from the pen the first day of the month. The key will show you the days on which each hen laid, which eggs were infertile, which were fertile and hatched, which had dead germs and the days on which each hen failed to lay.

| Day of Month | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hen No. 115 - - | F | O | F | O | O | D | O | F | F | O | F | D | O | F | I | I | F | I | O | O | I | I | O | O | I | I | I |
| Hen No. 116 - | F | F | O | O | F | I | O | D | I | I | F | O | I | I | O | 1 | I | I | I | I | O | I | O | O | I | I | I |
| Hen No. 117 - - | D | O | F | F | O | O | O | I | O | O | I | I | I | O | I | I | I | O | F | I | I | O | O | I | D | D | O |
| Hen No. 118 - | F | D | F | O | F | F | F | O | F | F | I | O | F | O | O | I | I | O | I | I | I | O | O | I | I | O | O |
| Hen No. 119 - - - | O | F | F | O | F | F | F | F | O | F | ---- | F | I | O | O | O | I | O | I | I | I | O | O | I | I | I | I |

Key 1---Infertile. F---Fertile and hatched. D---Fertilized but germ died. O---Did not lay on this day.

breeding stock. Sometimes it is caused by insufficient moisture, which causes excessive evaporation of the egg, and it so happens that the chick lacks bulk, and the chick may kick and move around and yet be unable to bring the necessary pressure against the shell to make the first small opening, and when it does, the inner lining of the egg dries on the chick so it is unable to turn sufficiently to break the shell the remainder of the way. Sometimes we have too much moisture, and the chick becomes so large that it is cramped for room, making it impossible for it to crack the shell. Sometimes a poor incubator, or one which has not been given the proper attention, will cause the temperature to vary to such an extent that it will be first hot and then cold and weaken the germ so the chick dies before it is able to free itself from the shell.

There will be a good deal of difficulty in many flocks in securing fertile eggs during the first three months of the year. This may be due to one or more of a variety of causes. The hens may be in a rundown condition, due to improper care during the cold weather. On the other hand, too much food and fat may be the trouble. The hens may be in good physical condition and the food wholesome but not adapted to egg production. If the hens have laid heavily during the fall and winter this tends to affect fertility unfavorably. There may be too many hens with the male birds or the males may be too old or may, on the other hand, be immature. Lack of exercise may result in defective fertility.

The enumeration of these causes of infertility suggests the remedies to be applied. The principal thing to be secured is first class physical condition of the birds in the breeding pen.

### THE FERTILIZATION OF THE EGG

For the purpose of determining the time required to fertilize eggs after breeding pens were mated, and to determine the length of time eggs would continue to be fertilized by the male germs after all males had been removed from the breeding pen, we made a number of tests. A careful record was kept of every bird, male and female, and all eggs immediately incubated.

The above test was made in April with yearling White Leghorn hens and a cockerel of the same variety. The male was removed from the pen on the first day of the month and no other male was allowed to run with the hens, to determine how long after the male was removed before the eggs would all be infertile. The result was as follows:

## TEST NO. 2.

| Day of Month | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Hen No. 115 - | I | O | F | F | O | D | D | F | F | O | F |
| Hen No. 116 - | O | O | F | F | O | D | D | O | F | F | F |
| Hen No. 117 - | O | I | I | F | O | F | F | F | O | D | F |
| Hen No. 119 | O | D | F | F | O | O | F | F | O | F | F |
| Hen No. 121 | I | I | O | F | D | F | F | D | O | F | F |

Key: I---Infertile. F---Fertile and hatched. D---Fertilized but dead germs. O---Did not lay on this day.

Hen No. 115—The last fertile egg was laid on the 17th day after the male was removed. Hen No. 116, fertilized her eggs for 11 days after the male was removed. Hen No. 117—The last fertile egg which hatched was laid 19 days after the male was removed. Two of her eggs were fertilized on the 25th and 26th days, but the germs were weak and died. One egg was fertilized on the fourth day, and she laid seven eggs in the following fourteen days, all of which were infertile; then fertilized another egg on the 19th day and again on the 25th and 26th. Hen No. 119—Last egg fertilized was laid on the 13th day after the male was removed. Hen No. 121—Last egg fertilized on 12th day after removing the male. Most of these hens were treaded only once and the male then removed. This indicates that if you have an exceptionally good male that you could mate him to 20 or 25 females, give them all the range possible, feed and handle them as breeding stock should be handled, and you can expect reasonably good results. If a male has the right amount of vitality to fertilize a reasonable per cent of the eggs in a pen of ten females, he will take care of 20 just about as satisfactorily.

The above test woud also indicate that where males of one variety are allowed to run with hens of another variety that it is not safe to save eggs for hatching in less than three or four weeks after the male

## TEST NO. 3.

| Variety | Band No. | No. of times hen was treaded | Day of Month | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 |
| **S. C. W. Leghorn** | 887 | 1 | O | O | O | I | O | I | F | O | F | O | O | F | O | O | F | O | O | O | O |
| **S. C. W. Leghorn** | 890 | 1 | O | O | O | O | O | F | F | O | F | O | O | O | O | O | O | I | O | O | O |
| **S. C. W. Leghorn** | 896 | 1 | O | O | O | O | F | F | O | F | O | F | F | O | O | F | O | F | O | F | O |
| **S. C. W. Leghorn** | 855 | 2 | O | O | O | I | F | O | O | F | F | O | F | F | F | O | O | O | O | I | O |
| **S. C. W. Leghorn** | 881 | 2 | O | O | O | O | F | O | O | I | I | O | O | O | I | O | I | O | O | O | I |
| **S. C. W. Leghorn** | 899 | 2 | O | O | O | F | O | O | F | O | O | O | O | I | O | O | I | O | I | O | I |
| **S. C. W. Leghorn** | 886 | 3 | O | O | O | O | O | F | I | O | F | O | F | F | F | O | I | O | O | O | O |
| **Barred Plymouth Rock** | 762 | 3 | O | O | O | O | O | O | O | O | D | O | O | O | O | F | O | I | I | O | I |
| **S. C. Rhode Island Red** | 885 | 3 | O | O | O | O | F | O | O | I | I | O | O | O | F | O | I | O | O | O | I |

Key: I--Infertile. F--Fertile and hatched. D--Fertilized but germ died. O--Didnot lay on this day.

**has been removed. If a male is introduced in a pen which was preceded by another male, you are not absolutely safe in crediting the fertilization to the last male in less than four weeks though a majority of the eggs will safely be fertilized by him in three weeks, and some will be fertilized by the second male much sooner than that.**

**The same hens and the same male were used as in the above test. Males were kept from the hens until every egg was infertile. Then the same male was placed with them on the morning of the first day of the month. On the second day hen No. 119 laid an egg which was fertilized, but the germ was dead. On the third day three hens fertilized their eggs. and on the fourth day every hen laid a fertilized hatchable egg. This would indicate that you can begin to save eggs for hatching after a male bird has been in the pen for three days. One egg was fertilized in less than 24 hours after the male was placed in the pen.**

**The above test was made in June when the hens were not laying very prolifically. A S. C. White Leghorn male was used, and no other male had been allowed in the pen with the hens for six months previous. The hens were treaded the same number of times as indicated, but the copulation all took place on the same day. Some hens were treaded once, others twice, and some three times. Not an egg was laid by the hens until the fourth day, and on that day one was fertilized and two were infertile. In the case of one hen, No. 896, she was treaded by a male only once and the male removed from the pen and no other male allowed to mate with her. She laid eight eggs in the following 18 days and the last laid on the 18th day, every one of them being fertilized at the one treading. One hen's eggs were fertilized for five days only, and she was treaded twice.**

**The semen deposited by a male bird contains hundreds and thousands of germs, and if it were not for the fact that a greater portion of these germs are destroyed by various causes and for various reasons, a single copulation by the male would deposit enough germs to fertilize all the eggs laid by an ordinary hen in a year's time. The reason these eggs are fertilized in some cases for three weeks after a male has been removed from the pen is simply because some of the germs remain alive and active for that length of time in the oviduct or body cavity surrounding the ovary.**

**We found from the above test with hen No. 896, which was just removed from the trap-nest after laying an egg, and the male treaded her shortly after this, that her eggs were fertilized first and longest and hatched best, even though she was treaded only once. Our observation has led us to believe that the reason a hen cackles after laying is simply a wise provision of nature. Her sole object in laying an egg is to reproduce herself, and fertilization seems surest and best if copulation takes place soon after the hen has laid, and she thus cackles to inform the male that the oviduct is clear and she is in the best condition to fertilize the next ovum which is in the process of development.**

**In view of the above experiments, we would rather have one good male at a fair price than a half dozen males of questionable quality at a low price. A lot of surplus male birds of questionable quality kept around the poultry yard are a nuisance and a great expense. We believe that the average poultryman keeps too many roosters. If he has an exceptionally good male he should cross him on all the females possible. We would rather have one good male to breed from than a half dozen males of medium quality. The more hens you can cross on your best male the larger per cent of high quality chicks you will have. It is a mistaken idea that a male has to mate with a hen for every egg which is fertilized.**

**Prof. Phillips of Purdue University also made some tests along this same line and in speaking of the question in the Country Gentleman, he had this to say:**

**"How many hens should be placed with one male? The general recommendations are eight to ten for the heavy breeds, ten to twelve for medium sized birds and twelve to fifteen for those of small size. A test was made last spring with a Leghorn cockerel and ten hens. These birds**

had been together all through the breeding season and were kept under good ocnditions. They were observed for two successive days from 6:40 A.M. to 5:30 P. M. The hens were marked so that they could easily be identified. The number of matings with each hen is listed below.

### MATINGS FOR EACH HEN

| Hen No. | First Day | Second Day | Ave. No. Daily Matings |
|---|---|---|---|
| 1 | 3 | 2 | 2.5 |
| 2 | 4 | 5 | 4.5 |
| 3 | 3 | 2 | 2.5 |
| 4 | 3 | 4 | 3.5 |
| 5 | 3 | 3 | 3.0 |
| 6 | 1 | 1 | 1.0 |
| 7 | 4 | 3 | 3.5 |
| 8 | 1 | 2 | 1.5 |
| 9 | 2 | 1 | 1.5 |
| 10 | 1 | 2 | 1.5 |
| Total | 25 | 25 | |

"The male showed no preference as to the hens he desired to mate with and the hens really controlled the mating. This point was markedly shown by the broody hen that would not permit the male's attentions until she had been off the nest for twenty-four hours. She began laying nine days later and her eggs were fertile. If one union fertilizes many eggs the method of management mentioned above was uneconomical, for the male could have been used with many more hens. Some examples of this fact are shown by the following: One flock of 260 pullets had ten cock birds with it and produced eggs that hatched more than sixty per cent of the eggs set. One flock of thirty-five females had only one three-year-old cock bird with it and the fertility was very satisfactory. One male that had been taken away from his flock for fifteen days was returned one afternoon and in three hours he mated thirty-eight times."

"Sometimes the question arises as to the time of day for successful breeding. One test involving twenty trap-nested females and one male, where mating was controlled, showed that matings just before laying gave no future fertility. Matings just after laying produced an average of five fertile eggs per hen. Of the matings on days when no eggs were laid, slightly more than half the number were fertile. Unions just after laying seemed the most efficient.

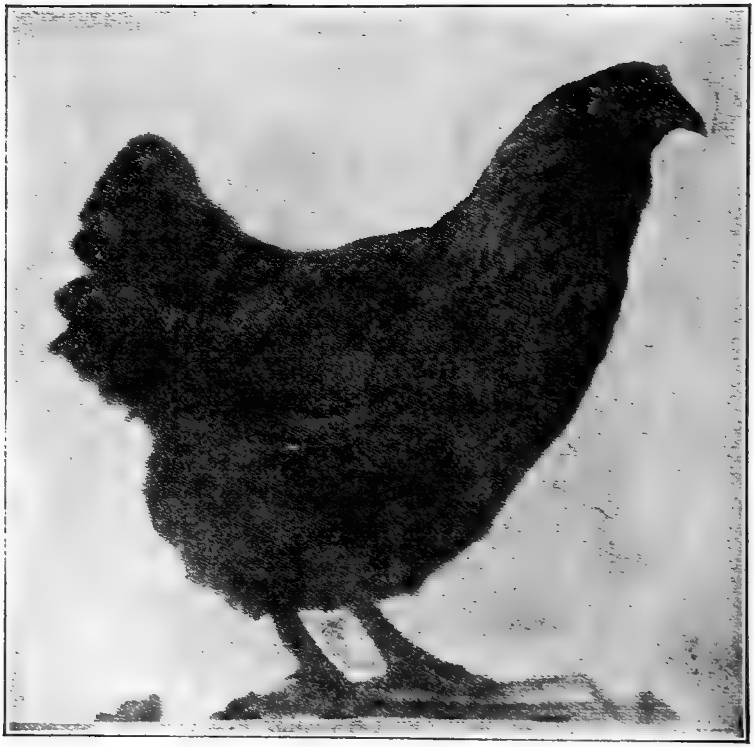
"On the farm the male should run at liberty with the hens during the breeding season, and if vigorous should have a large number of females with him. For the breeder, a scheme sometimes used is known as the 'studpen' method. The hens are leg-banded and trap-nested. A certain number of hens are assigned to each male and leg-banded with the same colored band. Each male is banded with the color of his hens and placed in a near-by coop, in which there is suitable room for exercise and an outside run if possible, although it may be made two by three or four feet and placed on the wall of the hen house. As each hen lays, her egg is recorded. She is placed in the coop with the male every few days. Very successful fertility has been secured this way.

"The farmer who uses cockerels with yearling hens will find it advisible and economical to sell his old breeding males at the close of each breeding season. The breeder who desires to use his males another season will find it satisfactory to isolate the male birds in groups of five or six, away from the females, where shade and room for exercise are abundant. This means comfort to the hens, infertile eggs and increased vitality in the males.

"Don't keep too many roosters. They are expensive and not necessary."

## AN EXPERIMENT IN ARTIFICIAL FERTILIZATION

We have been making some experiments along this line and have some living chicks hatched from eggs laid by hens which have never been allowed to run or come in contact with, or be treaded by a male bird. From what experiments we have made, I believe we can collect the semen from the champion Barred Plymouth Rock male bird at New York, Madison Square Garden Show, carry it to Missouri and then fertilize eggs from the champion pullet at the Missouri State Show if that pullet is in laying condition. The semen would have to be kept at a reasonable temperature. Artificial fertilization of eggs may never be practical, but we learn other things as a result of work of this kind. We have been surprised to learn the length of time the male germs will live out of the body of either the male or female. We have allowed the semen to become perfectly dry, and then after two hours or more, moisten it and found hundreds of spermatozoa still living and moving over the field under the microscope. Our experience has led us to



The above shows a pullet hatched from an egg which was fertilized by taking the semen from a Barred Plymouth Rock male and injecting it into the cloaca of a Light Brahma female. The germs then worked their way up the oviduct of the female and the eggs were fertilized. In doing this work, male birds were kept in wire pens where they could see females in the adjoining pens. The males were handled each day and they soon became very gentle, so much so that in a few days if we entered their pens with a female in our hand the male bird would attempt to tread her while she was still in our possession. Instead of letting him connect with the female we would slip our hand between the male and female and the semen would be caught in our hand, a glass dish or in a rubber bag. An ordinary medicine dropper with a rubber bulb was used to inject the semen into the cloaca of the female. If you have a vigorous male, several females can be injected with the semen from a single male. This work was done at the Missouri State Poultry Experiment Station. This cross of a Barred Plymouth Rock on a Light Brahma made a black fowl with a neck marked like a Brown Leghorn pullet.

believe that about five per cent of the females used for breeding purposes are practically sterile, that is, that their germs are so weak that they do not fertilize or else the semen is lacking in male germs. We have living chicks hatched from eggs artificially fertilized, artificially hatched and artificially brooded. Some interesting facts are being developed with reference to this work and mention will be made of them in later reports.

The Oklahoma Experiment Station had done considerable work along this line and in a recent circular issued by that institution they have this to say:

"The question was, whether or not eggs could be fertilized by seminal fluid transferred from one female to another. If that could be done successfully, could a sample be diluted with a physiological salt solution and injected into the cloaca of several hens with equal success. From our knowledge of the life period of these cells and the number of them passed at one service, this latter method would appear very practical. And, if it did prove successful, there would be nothing to prevent a man who possessed a valuable male to stand his bird, as in stud breeding. The semen might be sent by mail and the receiver could treat a large number of his hens at a small expense. Poultry, unlike other animals, have no periods of heat, so they could be treated any time samples may be received.

"In order to test this out several hens known to be laying infertile eggs were treated in the manner suggested above with undiluted fluid, and a fair per cent of the eggs were fertile. These eggs were incubated and chicks hatched from them.

## THE FIRST FOOD FOR BABY CHICKS

Millions upon millions of baby chickens die on our farms and in our poultry yards each season. As a result the loss in eggs and labor in hatching is tremendous. Much of this is due to improper methods of feeding and can be avoided. The newly hatched chick is a very tender and frail little creature just after having picked his way from the shell. If the chicks have been well hatched the comfort of the chicks and the feed given them are the two main things which will mean success or failure, and these are the two things which require your most careful consideration. See that they are comfortable, not to the extent that you nurse them, but they must be kept reasonably warm, dry and active.

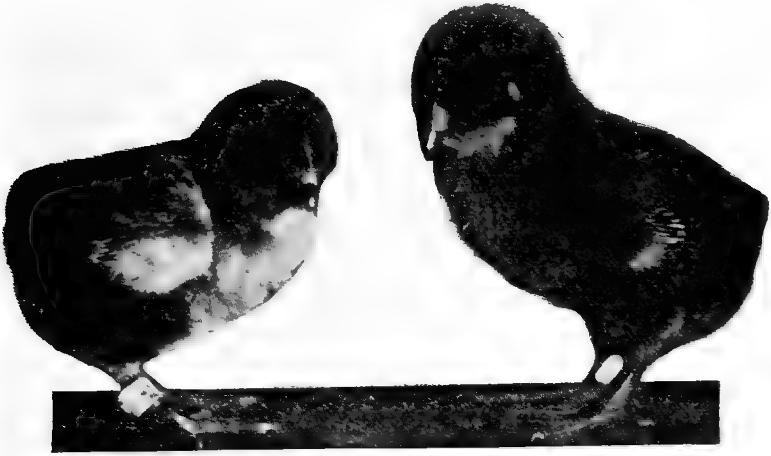


Fig. 36. When the chicks are from 24 to 72 hours old is about the best time to begin feeding. Sour milk or butter-milk should be kept before them for the first week, and you can thus avoid many cases of white diarrhea. Water can be given the last half of the day after that time if it is preferred.

Some of the mistakes in feeding are those of feeding too soon after being hatched, feeding too freely, feeding sloppy food, feeding too much corn, feeding sharp commercial grit at the start instead of coarse sand, feeding other ingredients which should not be used at the very beginning. These and similar mistakes tend to irritate the digestive organs and intestinal tract. Such practices often result in the chicks having diarrhea. The chicks become dumpish, get out of condition and die rapidly.

During the past few years we have tried out several methods of starting baby chicks. If your chicks are troubled with diarrhea of any kind, or lack of vitality or slow growth, then try the following plan. It has been one of the most successful plans of feeding baby chicks we have ever used.

We sprinkle a little coarse sand, clover, alfalfa, fine cut straw, or clean litter, free from must and mold, over the floor of the brooder or hover before the chicks are placed in it. We provide a small fountain of sour milk or buttermilk for at least the first half of the day, and water may be provided for the last half. If you cannot get the milk, then see that pure water is always before them. We prefer sour milk to the use of sweet milk for the reason that much of the bacteria which we find in the intestinal tract cannot grow and develop in the acid of sour milk or buttermilk, but sweet milk hasn't the same effect. The chicks take to this as naturally as a baby takes to milk. The acid of milk aids digestion, kills and prevents the growth of bacteria and has an appetizing effect. The chicks are not fed for twenty-four to forty-eight hours after they are hatched. Don't feed too soon. Give the chicks time to assimilate the yolk of the egg which contains enough food to last them several days.

Begin by feeding a mixture of boiled eggs, cut very fine, and bread crumbs for two or three days, or feed two-thirds rolled oats and one-third wheat bran mixed with a small amount of charcoal. Oatmeal is the finest food known to give young animals. This is fed on a clean board or paper four or five times a day and only a small quantity is fed at a time. We remove the feeding board after the chicks are through eating. Clean sand is given about the time the first feed is given, and no grit is given before. We think sand is better to start chicks with than commercial grit, if it can be secured, and if not, then use fine commercial grit. Use the grit not too freely until chicks are at least ten days old. After chicks are four days old and you have been feeding them the rolled oats and bran for a day or two, we begin to add a little commercial chick feed to the above mixture and gradually increase this until the rolled oats and bran are eliminated from the first or grain feed. The rolled oats

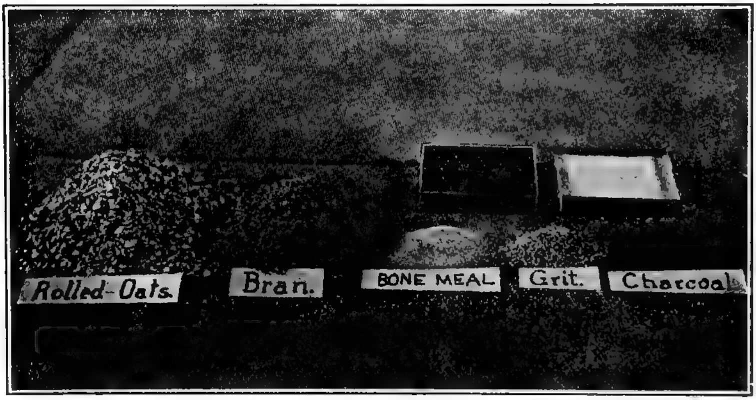
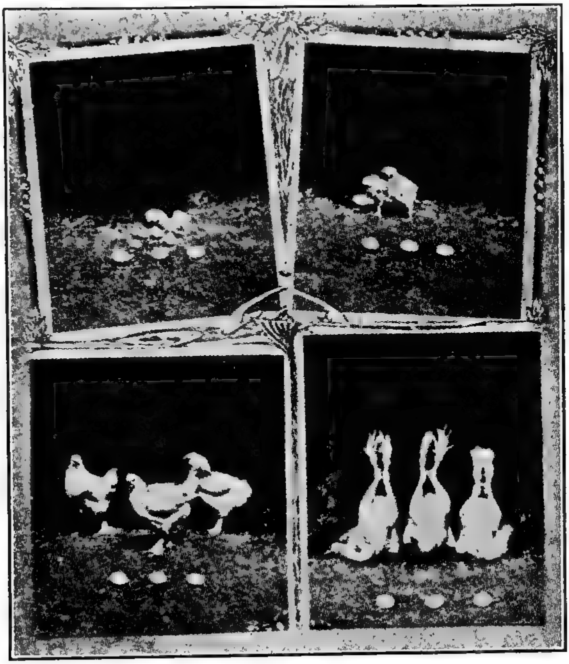


Fig. 37. The first feed. Two parts rolled oats and one part bran. Mix in a small amount of bone meal and charcoal. Provide grit when feed first is given or in a few hours following. We also furnish them with sour milk or butter-milk, or keep pure water before them

and bran are fed morning, noon and night, and a good grade of commercial chick feed is thrown into the litter between meals. This compels the little fellows to exercise, and they will soon begin to scratch as vigorously as if they had been at it for many weeks. You can almost see them grow and develop and become active and husky little fellows.

Wheat bran is wonderfully rich in mineral matter and it gives bulk. We feed a little of the above mixture of bran and oats and feed often. It is very important, and this must not be overlooked. The baby chick does not know enough to eat properly until it is taught, and where you raise chickens in large flocks the person looking after them cannot feed individual chickens. We have got to adopt a method so that some can teach others. It is sometimes advisable to put one or two larger chicks in with a bunch of small ones and let the larger ones teach the younger to eat. There should not be too much difference in their ages. You cannot expect baby chicks to scratch in deep litter and get out grain until they learn how to scratch. In four days' time they will usually learn.



(Courtesy of Reliable Poultry Journal.)
Fig. 38. From the shell to the frying pan.

The first feed should be given when the chicks are hungry, and that will be about twenty-four hours to forty-eight hours after they are hatched and dry. There is an inclination to feed chicks as soon as they are hatched, and this is erroneous. They have not hardened sufficiently. Nature indicates when they want to eat. The yolks they have drawn into their bodies before they are hatched furnish nourishment for the first day. It apparently acts upon the digestive system of young chicks as colostrum or the first milk of a cow does upon a calf. Do not try to make a chick eat until it is hungry. You can tell instantly when it is hungry —when they come running to meet you and when they are picking at each other. Forty-eight hours is about the time they grow hungry after hatching. Put water, also sour milk, before the chicks as soon as you feed them, or before. Give the chicks all the sour milk they will drink;

but make sure you use good sour milk or a good grade of buttermilk, and feed them properly.

At the age of six or seven days begin to feed a dry mash, the mash being made by mixing the following:

Two parts wheat bran.
One part shorts
One part corn meal.
One-half part rolled oats or oatmeal.

We add one-half pound of very fine salt to each 100 pounds of the above mixture, and also add a handful of fine charcoal and a handful of bone meal or finely granulated bone. This improves the mash, but can be eliminated without any serious loss. After the chicks are two weeks old we begin to add a small quantity of dry beef scraps to the mash mixture. If the chicks are on free range and get plenty of bugs and worms, they do not need the beef scraps, neither do they need the beef scraps if they have plenty of sour milk or buttermilk. After the chicks are a week old the grain mixture should be thrown into a fine clean litter or worked into fresh soil so the chicks will be compelled to exercise. If confined to a board or concrete floor, keep a shovel or several shovelfuls of clean soil on a portion of the brooder or hover floor so the chicks may scratch in this. If the chicks can be raised at all they will unquestionably do well on the above feed.

Some farmer may say, "I cannot afford to buy the commercial chick food nor the rolled oats." We wish to say that you can well afford to buy anything for the first few days feeding if it will insure you a greater number of strong chicks and lessen their mortality. The small amount of anything, no matter what it costs for the first few weeks of a chicken's life, ought to be used if it proves to be the best food. One sack of commercial chick feed and a 25c box of rolled oats will start quite a large bunch of chicks. You can work gradually into the use of cracked corn, wheat and Kaffir corn after the chicks are six weeks old.

Young chicks must be fed liberally and often the first few weeks. At the same time they must not be gorged and overfed. That is the reason we recommend the dry grains and dry mash method of feeding. It is safe and they cannot well overeat of these. We state that they must be fed liberally because of the fact that a little chick doubles its weight in six days. Prof. Atwood illustrates this with an example like this: An infant doubles its weight in 180 days, or in other words the machinery of a chick runs 30 times as fast as that of a child. Chicks weigh about 1½ ounces at hatching time, and you can make them weigh 2½ pounds at three months of age. This is 26 times its original weight. Then an infant that weighed ten pounds at birth, at the same rate of gain as the chicken, would be a cute little infant of 260 pounds at three months old. If the chick grows so rapidly as that, we can see the great need of plenty of food on which to make this wonderful growth.

We give young chicks all the sour milk or buttermilk they want from the time they are hatched until fully matured if it can possibly be supplied. If you chop up a few onions occasionally for the youngsters, these are good for them, keep them in condition and help supply the green food.

The infertile eggs may be boiled and mixed with some of the dry

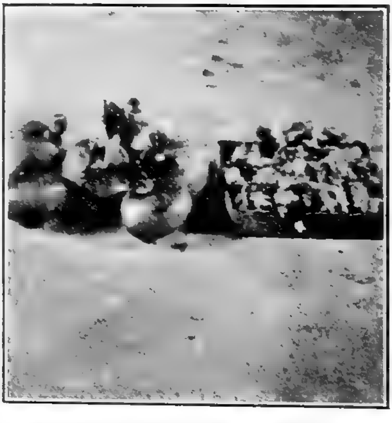


Fig. 40. Onions chopped fine or ground make a splendid food for the young chicks. They are healthy, whet their appetite and take the place of other green foods. They may be fed mixed with a moistened mash and should be fed sparingly.

mash and fed to the chicks. It is best to grind up the infertile eggs after they have been boiled hard, using shell and all, and mix them with equal parts bran and pinhead oatmeal or rolled oats. It is also a good idea to mix some charcoal with this first feed. Feed three meals of this and two of chick feed after the first day's feeding.

Dry bread crumbs may be mixed with the hard boiled eggs, or you may moisten bread crumbs with milk and squeeze these nearly dry and feed this for the first few feeds.

Keep the chicks growing every minute from the time they are hatched.

The poultryman is usually full of enthusiasm and builds many air castles about the time the chicks hatch, when they look so nice and fluffy, are happy and full of life, but very often these hopes are turned to despair, and a few days later everything seems to go wrong. While the natural absorption of the yolks is in progress just after hatching the chicks are perfectly contented and there is no strain on their digestive organs, but as soon as feed is placed before them their vitality is taxed and they seem to lack the strength to perform functions of digestion and various ailments result.

Young chicks require greater skill and more thought in feeding than do the mature stock. Poor appetites, uneven plumage, leg weaknesses, stunted growth and general debility of the growing stock are a few of the effects of improper feeding and poor methods.

A very good starting and growing feed for baby chicks can be made by taking equal parts of bran and corn meal and adding infertile eggs that have been taken from the incubator and sufficient buttermilk to make a sloppy dough or batter. Place this in an ordinary bread pan and then bake it in a slow oven for four to six hours until it is thoroughly dry. This is a splendid thing to mix along with the commercial chick feed and the dry mash which you give your young chicks.

As soon as infertile eggs are removed from the incubator they should be boiled immediately. If they are then kept in a cool place they can be kept for ten days or two weeks without any danger of being tainted.

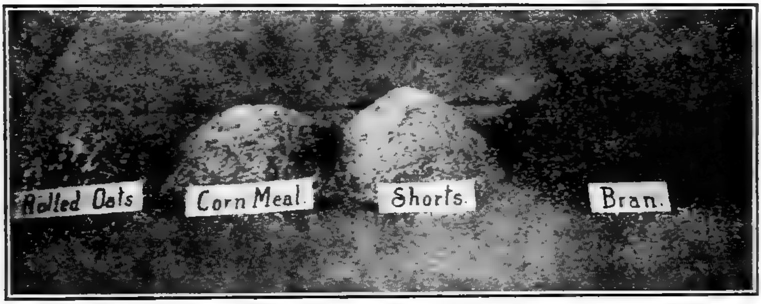


Fig. 39. At the age of four days the chicks then get the above dry mash, 2 parts bran, 1 part shorts or middlings, 1 part corn meal and ½ part rolled or ground oats.

In feeding moistened mashes care should be taken not to make the mash too sloppy nor to feed it too freely so that it will not all be cleaned up by the chicks. If this is done it is liable to sour and result in bowel trouble. It is a very good idea to add a handful of powdered sulphur to the moistened mash once a week; and also use a liquid that contains a small quantity of Epsom salts, which has been dissolved by mixing with water or sour milk, once a week with which to moisten the mash. The salts and sulphur tend to purify the blood and also to cool the blood in hot summer months.

Green food is quite necessary to the good health, growth and development of the young chick. Dandelion leaves or hearts of clover cut fine with a pair of shears or which has been run through a meat grinder seems to make the food more easily digested and is greatly relished by the young chicks. It is sometimes a good idea to run any sort of green food that you may have convenient through a meat grinder, for the reason that it comes out fine and juicy. These greens are sometimes mixed with the regular mash and the chicks usually eat them with a relish.

Perhaps no other institution in this country has conducted such a large number of chick feeding tests and experiments as has Cornell University. After trying out many different methods and summarizing their findings for eight weeks of raising they arrived at the following conclusion:

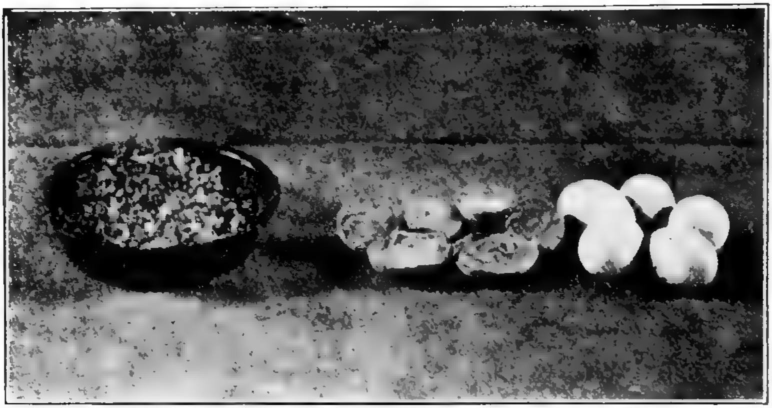


Fig. 41. Infertile eggs boiled hard and then crushed or ground and mixed with rolled oats or dry bread crumbs. This makes a splendid food for the young chicks.

1. Chicks appeared to need both cracked and ground food.
2. Chicks grew more rapidly on moistened mash than on dry mash, other conditions being equal.
3. Chicks fed from the first on dry mash and grain were nearly as large at the end of eight weeks as those that had been started on a moist mash and later changed to dry mash.
4. Skimmed milk mash produced growth on less food per pound gain in weight than did dry mash.
5. Chicks that were given hopper fed beef scrap from the first, in connection with cracked grain and ground food, made better growth than those started on a limited amount of beef scrap.
6. Chicks given a limited amount of beef scrap for the first three weeks grew better than those whose meat food was given in the form of eggs.
7. No ill effect was observed when beef scrap was hopper fed from the first meal, if given in connection with a well balanced ration.
8. When the other food given did not supply their needs, chicks ate sufficient beef scrap to cause high mortality from digestive ailments.
9. Sour skimmed milk proved of value for chick feeding.
10. Sour skimmed milk fed in a moistened mash gave better results than granulated milk fed under the same circumstances.

The method of feeding, which is used quite extensively in Missouri, is as follows:

FIRST DAY

"Yolk in body supplies food. Do not feed.

FIRST WEEK

"Boiled eggs cut fine, bread crumbs and oatmeal, equal parts. Feed in form of mash on clean board, all they will eat in 20 minutes, five times per day.

"Give sour milk each forenoon and water in afternoon.

"Keep fine grit or sand before them.

### ONE TO FIVE WEEKS

"Equal parts wheat bran, shorts, oatmeal and corn meal.

"Use as a mash in hopper and give good grade of commercial chick feed in litter.

"Two pounds fine charcoal and one-half pound fine salt should be added to each hundred pounds mash.

"Sour milk or water should be before birds at all times.

### FIVE WEEKS TO MATURITY

"One part ground oats, 1 part shorts, 1 part wheat bran, 1 part corn meal, ½ part beef scraps, ¼ part bone meal.

"Use this as mash in hopper, and give equal parts cracked corn and wheat in litter, all they will clean up in thirty minutes, twice each day. Fresh water and grit should be before them at all times. Free range should be provided."

### CHICKS NEED VARIETY

We sometimes make a mistake in feeding a ration to young chicks that is fattening rather than conducive to growth, muscle and frame building. These rich rations that are extremely fattening retard growth by clogging the system and finally result in the loss of appetite and in digestive disorders.

Chicks can be raised on corn alone where they have plenty of free range, but most poultry men should feed corn sparingly during the summer months to growing chicks. Corn is a food that is rich in carbohydrates and fat and these develop fat and heat rather than bone and flesh. Young chicks need a variety of grains and a balanced ration.

### KIND AND QUALITY OF CHICK FEED

Tainted food of any sort should never be fed to young chicks. Meat that is tainted is liable to cause death by poisoning. In testing meat scraps, pour boiling water over a sample of it which you have placed in a cup or hold some of the scraps in your hand until they become warm, and if they have the odor of cooked meat and not that of fertilizer, then the scraps are suitable for feeding.

Musty food such as cracked corn and corn meal, which have become heated should never be used. We sometimes find musty materials in commercial chick foods.

If you feed anything that is moulded it is sure to cause digestive disorders, which will result in trouble throughout your entire flock. If these spores are inhaled by the chicks, the mould will settle and grow on the membrane of the lung air sacs.

It is necessary for the feed to contain a considerable per cent of ash, which is best supplied by feeding bone meal.

As grit, there is nothing better for young chicks than coarse sand, which contains a lot of small pebbles.

Growing chicks require a very large amount of green feed, and for this purpose we would recommend kale, rape, swiss chard, lettuce, green clover, onions chopped fine, alfalfa, sprouted oats, or lawn clippings.

If the chicks are allowed to range with hens they find insects and worms and, therefore, do not require a large amount of other animal food, but if they are brooded artificially, animal food must be provided. Skimmed milk is excellent, fed either sweet or sour. Sour milk or buttermilk, however, is to be preferred. If milk is not obtainable we would recommend milkoline, granulated milk, or milk albumen. Beef scraps are one of the convenient forms of supplying animal food. We have never had very great success in feeding blood meal. Infertile eggs can be used to good advantage. In an experiment, which was conducted to determine the amount of beef scraps, which could be fed young chicks, the following was the result:

"Chicks under four weeks old, which were fed a mash containing beef scrap, and beef scrap in a hopper, ate twelve to fourteen per cent of total food in beef scrap; from four to eight weeks, they ate from seven to eight per cent. Chicks which ate twenty-eight to thirty-five per cent of total food in beef scrap had high mortality from digestive troubles.

Chicks which were given hopper fed beef scrap from the first meal grew better than others having a similar ration, but only a limited amount of beef scrap."

Wheat is the best grain food for young chicks, when given along as a grain. Corn is also good, but a mixture of corn and wheat is to be preferred. Millet is not good when fed in large quantities. Oats are a valued food, but contain too large a per cent of husk for young chicks, unless they are hulled, steel cut, rolled or ground. Your ration for best results should contain some variety. Feed bits of stale bread, cooked vegetables, scraps from the table, and add little knick-knacks of this sort occasionally to whet the appetites of your birds.

## CHICKS MAKE RAPID INCREASE IN WEIGHT

Some recent weights made by the poultry department at the State College of Washington, showed the following gains:

| | Leghorns | R. I. Reds | Rocks |
|---|---|---|---|
| Weight at hatch | 1.406 oz. | 1.458 oz. | 2,875 oz. |
| 3 weeks | 2.582 oz. | 3.375 oz. | 2.875 oz. |
| 4 weeks | 3.208 oz. | 5.125 oz. | 4.541 oz. |
| 5 weeks | 5.625 oz. | 8.416 oz. | 7.708 oz. |

"Birds are the most active, maintain the highest bodily temperature and perform the most rapid digestion of food of all the domestic animals. It follows that all their functional activities, that is, their bodily processes, must be raipd. It also follows that results of wrong care or feeding are not only more quickly disastrous, but the disaster is more likely to be lasting than with other animals. One may give the most painstaking and skillful care to a flock of brooder chicks during the first three weeks of their lives, and then by three hours of neglect under just the right combination of unfavorable conditions may ruin the whole lot. Mistreat a colt or a calf for a week and it is quite possible to repair the damage. Mistreat a growing chick for a week and the chances are in favor of having made a runt of it for life. In its rapid growing period there are no stops for the repair of damages."

## SEPARATE THE OLD FROM THE YOUNG

If young chicks are allowed to run in the same yard where there are older fowls, there should be some sort of a feeding coop arranged so that the young chicks can eat in peace and not be run over, injured and disturbed by the older birds. A little precaution and an extra coop for this purpose will always compensate for the time and trouble required to prepare same.

## FEEDING GROWING STOCK

When the chicks have reached the age of six weeks we then place a dry mash before them composed of 2 parts bran, 1 part shorts and 1 part corn meal. This is placed in a hopper. It is also a good idea to mix a little fine charcoal in this ground feed, also a half pound of fine salt to every 100 pounds of the mixture. This mash is used until they are fully matured. From the time the chicks are six weeks old until maturity you can feed them equal parts cracked corn and wheat, fed in hoppers. If you cannot furnish your chicks with the sour milk or buttermilk it may be necessary for you to add one-half part of high grade dry beef scraps to the dry mash if your chicks haven't free range and do not get a liberal supply of bugs and worms.

Look out for the lice and mites. Keep the coops, hovers and houses clean. Don't let the drinking pans go dry. Keep the chicks active and growing. There is no better place on a farm to grow them than along the edge of the corn field. Pull your coops and colony houses there this season and give it a trial. The chicks will follow the cultivators across the field, consume many injurious insects and worms, and will grow strong and husky.

There are many other ways of feeding baby chicks and growing stock. Some feed all they will eat from the day they are hatched and have good success. Some put enough feed on the bottom of the brooder to last the chicks ten days. They bury the feed in a litter of alfalft and grit and let the chicks dig it out as they need it. Others feed nothing but corn chop or cracked corn. Others do not give a thing to drink for ten days—simply moisten a mash and the chicks are compelled to do without water or milk. Others give a big feed of grit at the very beginning and let the chicks fill up on that first. Other things equally as radical are practiced by farmers and poultry raisers and some of them succeed with such methods, but they are not safe or practical for the average person. If you can succeed with any method of starting and feeding baby chicks, you can succeed with the method which we have outlined and recommended above. Don't let someone lead you off on some impractical theory.

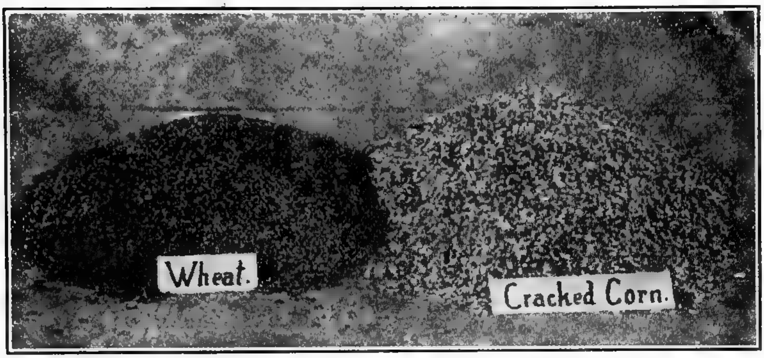
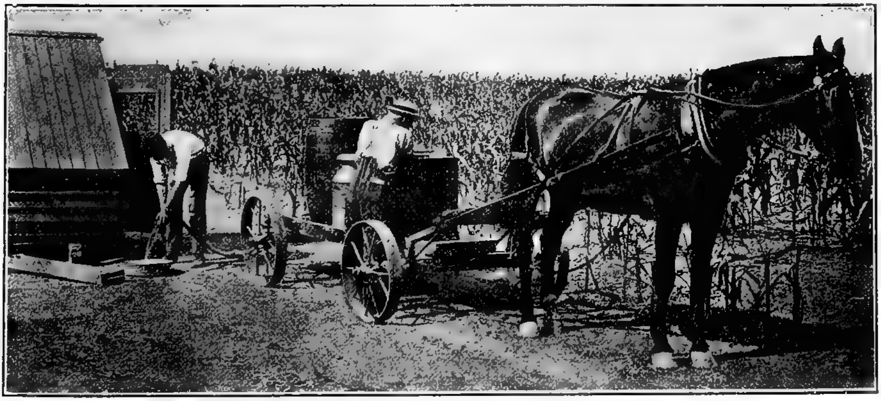


Fig. 42. About the most economical feeds you can use as a grain ration from the age of six weeks on to maturity are equal parts of wheat and cracked corn. Feed a dry mash in addition to this as recommended above.

## HOPPER FEEDING IS BEST

The use of hoppers for feeding both grain and dry mash after the chicks are six weeks old is a good practice. By this time they are usually placed out on free range in coops or colony houses provided for that purpose. If you continue to feed the chicks by hand when you



(Courtesy of Cornell University.)

Fig. 43. This is the method which is used at Cornell, is used at this institution, and is practiced on many of the more successful poultry farms. The growing stock should be given free range in a cornfield, clover field, an orchard or in some such place, and the grain, water, milk, etc., handled in this manner.

open the house each morning to let them out, they will wait and follow you and beg you to feed them. They will fill up on grain or feed which

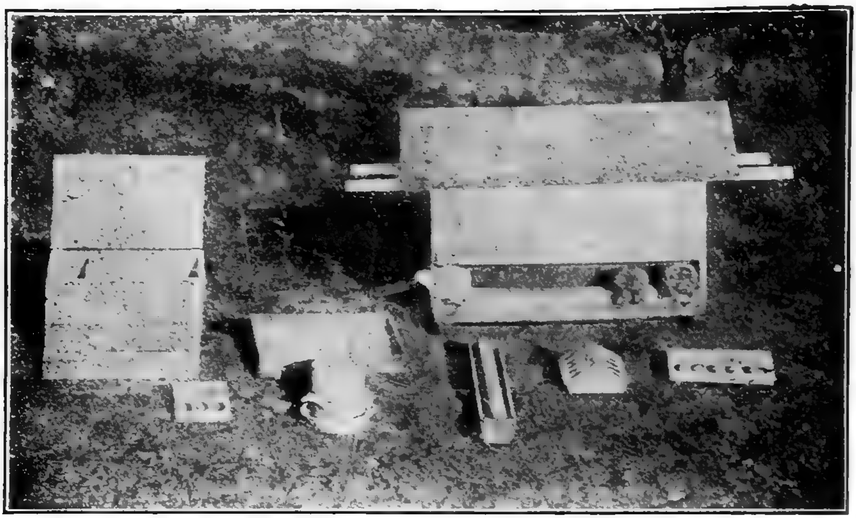
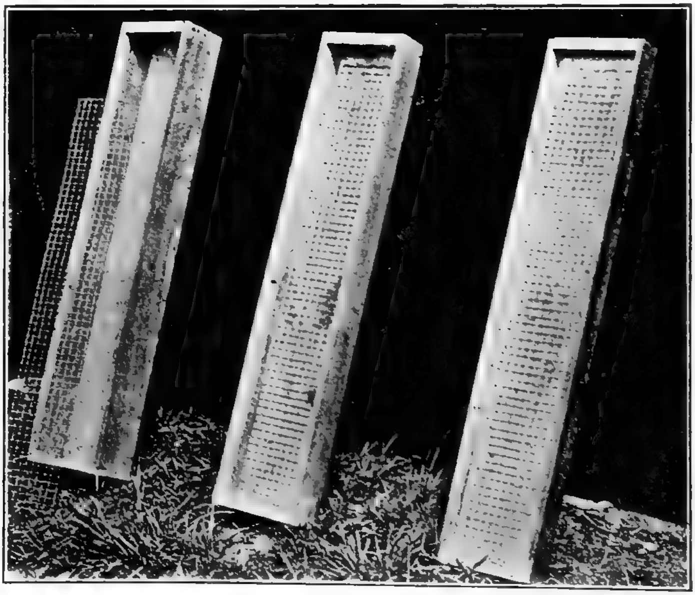


Fig. 44. Some of the hoppers used in starting and feeding baby chicks at the Missouri State Poultry Experiment Station at Mountain Grove, Mo. The main feature in building any hopper is to arrange it in such a way that the chicks have easy access to the feed, and at the same time have it arranged so the feed cannot be wasted or soiled by the feet of the chicks.



(Courtesy of Cornell.)

Fig. 45. Some small troughs with wire on the inside to prevent the feed from being scratched out. These are used for the first dry mash given the baby chicks. We recommend making them very narrow and rather long, as this prevents the chicks from crowding in and soiling the food with their feet and droppings.

you give them. They then sit around and wait until the noon feed, and just so at night again. The result is that they follow around after you every time you come in sight, and they are never satisfied or contented and do not hustle and get the exercise or develop as they should. But if you place the feed all in hoppers when you turn them out of the coops and hovers each morning, they pay no more attention to you than if you were not there. They rush by you and on by the hoppers containing the feed and out into the clover or cornfield or orchard in search of worms, bugs, etc. They soon learn that the food is always there when they want it, and they also learn that the "early bird catches the worm," and they go in search of them first. They then come back to the hoppers and fill up on grain and dry mash. But if you hand feed, unless you are an expert, the chicks fill up on your feed and then sit in the shade of a tree until they see you coming in sight again. The chicks know much more about their wants than does the average inexperienced person who attempts to raise poultry. For this reason we think your results will be far more satisfactory if you feed the ration recommended above for growing stock, and feed it in a hopper and allow the chicks to help themselves after they are six weeks old. By actual test they do not eat any more where they are hopper fed than where they are hand fed.

## FEEDING A MOISTENED MASH

Our experience has been that chickens will make a much more rapid growth after they are six weeks old if they are given a moistened mash once a day than when they are kept on an entirely dry feed. We take some of the same dry mash recommended under "Feeding Growing stock," 2 parts bran, 1 part corn meal and 1 part shorts or wheat middlings, and slightly moisten this with sour milk or buttermilk. Do not give the chickens all they will eat, but about 4 o'clock in the afternoon give them all they will clean up in thirty minutes. Never feed this so freely that any will be left to become sour. Feed this on a clean board for the purpose or in a small trough. Send them to roost with full crops.

## HINTS ON FEEDING AND MANAGEMENT

Give charcoal, oyster shell, grit and ground bone at all times. A good many people believe chickens can be raised successfully on a chick feed of grains only. Our experience is that we cannot grow big chickens on cracked grain alone. In one of the experiments at Cornell University, chickens starved that had nothing but ground feed from the day they were hatched until they were twelve weeks old. They were at the hopper eating all the while, and so much of their time was spent in eating, trying to get enough of that dry ground feed down them, that they failed to eat the grass in their yards and it grew to a considerable height; whereas the chicks in all the other houses had the grass eaten before they were six or eight weeks old. Why was it? The fine, ground feed was so dry and fine that they could not eat it fast enough to supply their bodily needs.

Charcoal is a corrective. It is a good idea to have some in a hopper so the chicks can help themselves. Use fine or ground charcoal and the chicks will eat great quantities of it. This will correct many cases of diarrhea. Keep it in a small box, glass or galvanized hopper so the chicks can help themselves.

Here is a most important statement, and one that must be borne in mind by all feeders of any kind of live stock, and that is, "Make all changes gradually." Periods ought to lap over a week or two. For a person to go abruptly from one ration to another would result in trouble.

More important than the ration is the close attention, the care, the cleanliness, the regularity, the neatness of the person doing the work.

Dry food is best. It does not sour if it should not all be eaten, and they will not overeat of it. The grain food can be put in a litter and the chicks get exercise in working for it. We believe in making the dry feed

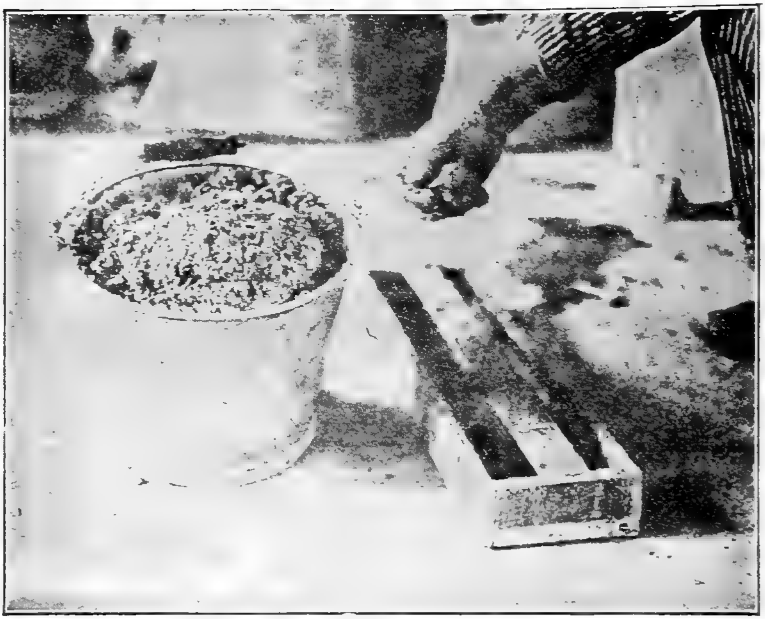


Fig. 46. We mix up a bucket of moistened mash, and feed it each afternoon. Use the same dry mash which we use in the hoppers, but moisten it with sour milk or buttermilk. Feed just such an amount as they will clean up in about 30 minutes. Don't feed too freely, and let the feed remain to become sour and moulded. Don't make the mash sloppy.

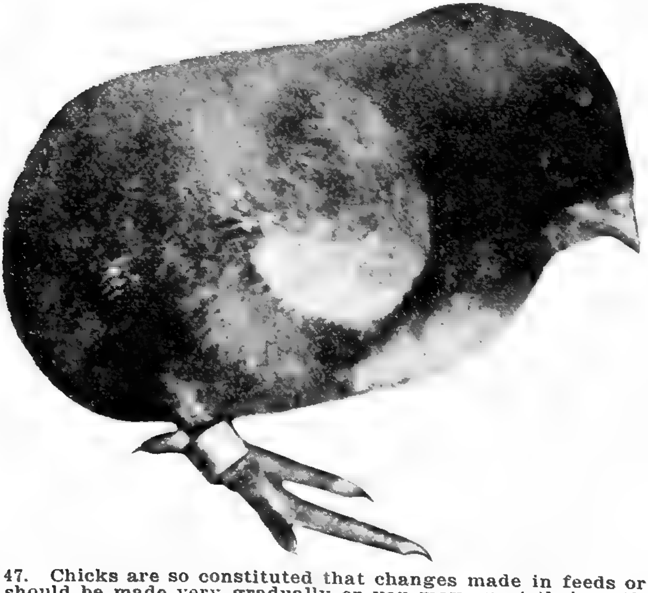


Fig. 47. Chicks are so constituted that changes made in feeds or feeding methods should be made very gradually or you may upset their entire digestive system.

the bulk of the ration, but feed a moistened mash once a day for quick growth and to whet the appetite and add variety.

The chicks need a variety of food.

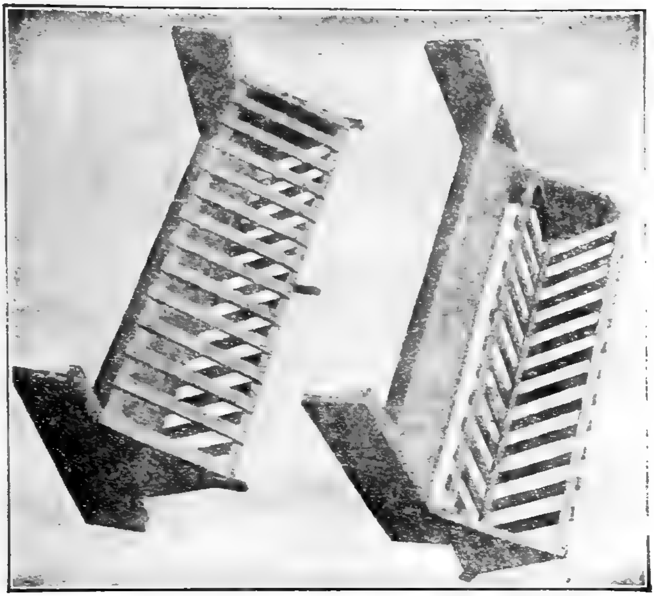


Fig. 48. A very good trough for feeding moistened mash to growing stock and to prevent them from crowding into the trough and soiling the food with their feet.

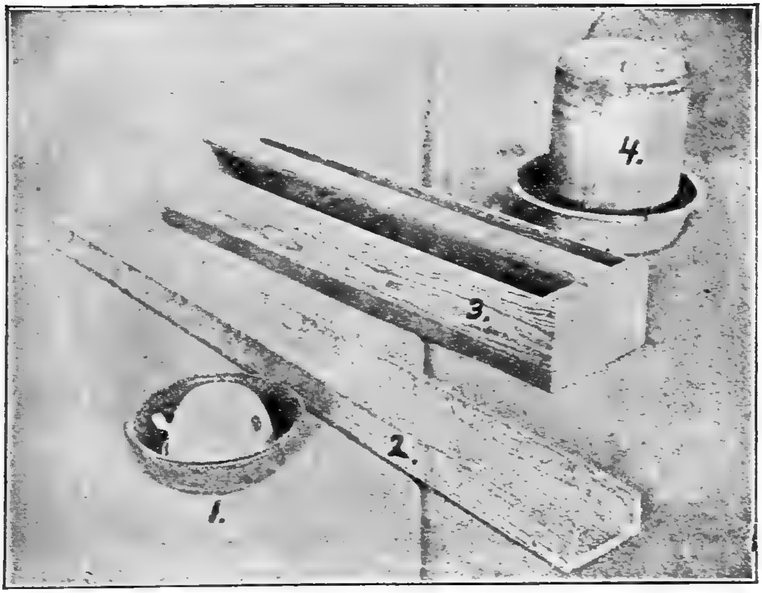


Fig. 49. This illustrates some of the feeding troughs used for baby chicks and also two plans of supplying milk and water.

Do not feed a wet, sloppy food and overfeeding is as deadly as disease.

Do not buy chick feed with much weed seed in it. Why should any farmer pay $2 or $3 per hundred pounds for weed seed to stock his farm with them when he has too many weeds of his own and millions of weed seed which the poultry can get if they need them? Weed seed is sometimes put in as a filler, but is often dangerous and expensive.

If you will cut or grind up some onions for the young chicks about three times a week for the first two weeks, they will learn to relish them and be benefited by them.

Do not forget to put sand or grit before the young chicks.

A very good feed to start little chicks with is hard boiled eggs, crumbbled up, shell and all, mixed with common bread toast, oat meal or wheat bran. Raw egg may be mixed with the other ingredients in preference to the hard boiled eggs. Feed what they will eat up clean every two or three hours for the first few days. If you start them with this method, after the second day's feeding, you can begin to feed some commercial chick feed, or cracked corn, wheat and hulled or ground oats.

Feed the chicks regularly and liberally.

Do not overcrowd.

Supply water and sour milk or buttermilk in abundance.

Give the chicks an opportunity to exercise out of doors.

Leg weakness is almost certain to develop if the chickens are raised and brooded continuously on a board or concrete floor.

Keep the hover temperature high enough to insure comfort and prevent crowding.

Don't bother with weaklings.

Move the chicks to larger quarters as soon as they can do without heat.

Give the growing stock free range if possible.

When the chicks get to be 48 hours old they usually eat without being taught, but it is not a bad practice to dip the bills of a few into the water or the buttermilk. The remainder will soon follow these few in drinking. Also, when the first feed is placed before them, rap gently on the feeding board or the brooder with your finger nails and the little inquiring fellows come toward you to investigate this strange sound, and in this way learn to eat and drink.

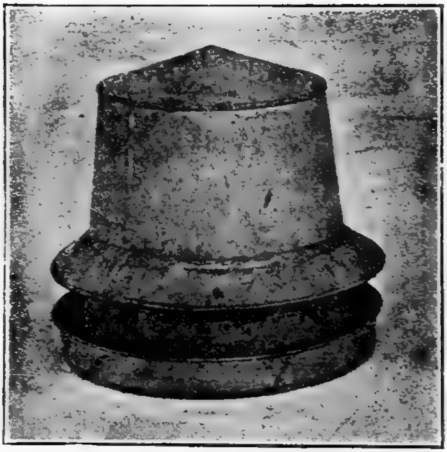


Fig. 50. A drinking fountain designed by Cornell University and one which is quite satisfactory.

It is often a good plan to place one or two slightly older chicks in the brooder with each flock. See that these are not diseased and are free from lice, and do not select chicks that are much older. These will teach the younger ones to eat and drink.

There is something which chicks find by scratching in fresh earth that seems to be beneficial. We therefore recommend that you place several shovelfuls of clean, moist earth in the corner of the runway of each brooder. Their appetite seems to call for this.

The best animal food for baby chicks is the bugs, worms, grashoppers and insects which they can find on free range. If they haven't this, then it is necessary to furnish them with fish scraps, dry beef scraps, buttermilk, sweet milk, ground bone or fresh meat. We prefer sour milk or buttermilk to any of the others. You may dilute it by mixing one-third water with the buttermilk if it is very rich. We sometimes do this until the chicks are three weeks old. Never feed sweet milk one day and sour milk or muttermilk the next. If you start with sweet milk, stay with it and do not be changing from one to the other.

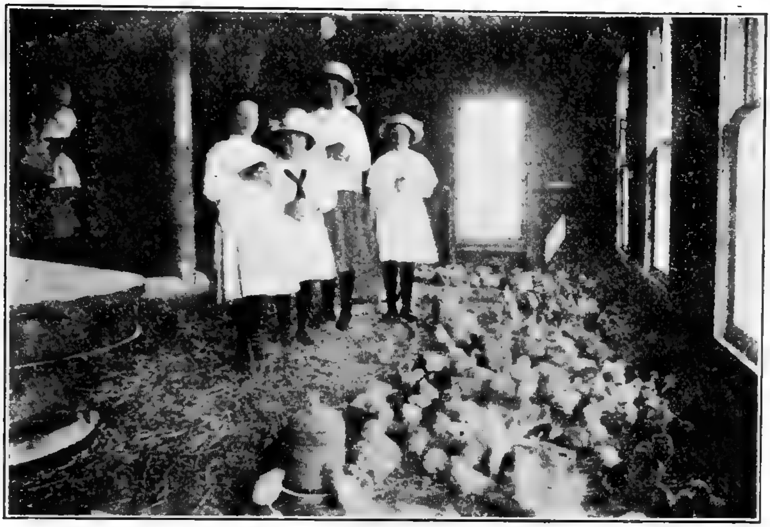


Fig. 51. One thousand chicks being fed and successfully brooded in a single room 14 by 20 feet in size.

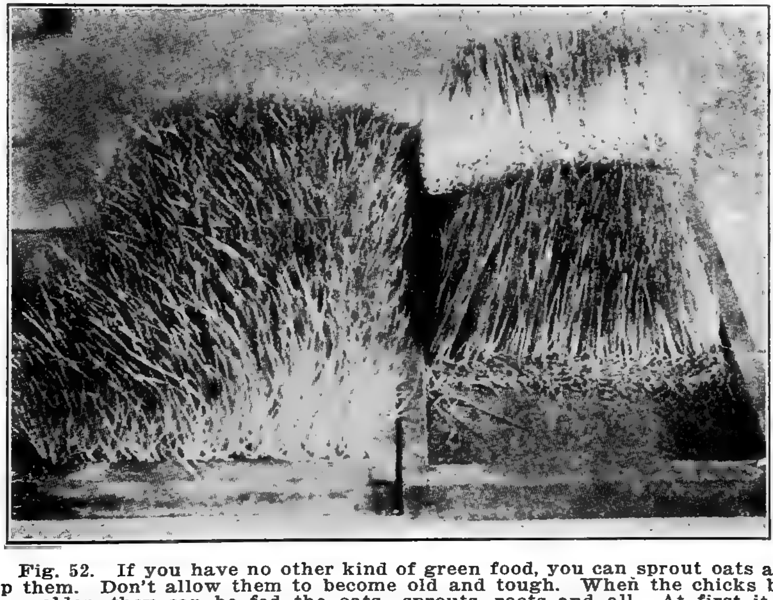


Fig. 52. If you have no other kind of green food, you can sprout oats and clip them. Don't allow them to become old and tough. When the chicks become older, they can be fed the oats—sprouts, roots and all. At first it is best to let them have only the tender clippings.

Green food can be supplied in the form of fresh cut clover or alfalfa, or lawn clippings, onions or clippings from fresh sprouted oats. There is nothing better than grass or clover range. Onions are fine for young chicks. They should have green food in some form.

Do not forget the oyster shell, grit, sand or gravel, granulated bone and charcoal. Hard coal ashes are good for chicks.

Feed early and late—that is, the chicks are much like a little babe or a growing child in this respect, and need food often. After doing without eating all night it is very necessary that their first food be given as early in the morning as possible. Also feed late at night so they will have sufficient nourishment to carry them over until morning.

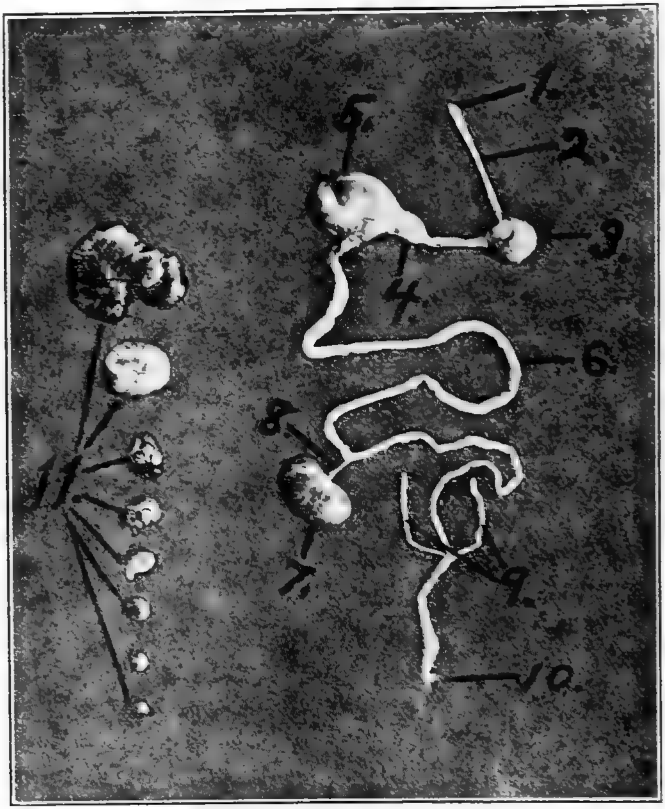


Fig. 53. This shows the main canal through which the food passes from the mouth to the vent. This intestine was taken from a chick three days old, but the undigested yolks on the left were taken from chicks practically two weeks old. The yolk contains enough food to last the chick several days and if it is fed too soon the yolk remains unassimilated, as is shown by the yolks on the left. 1. Mouth. 2. Aesophagus. 3. Crop. 4. Stomach. 5. Gizzard. 6. Intestine. 7. Unassimilated yolks. 8. Duct leading from the yolk to the intestine. 9. Caeca. 10. Vent. 11. Unassimilated yolks removed from chicks two weeks old. The yolk in the above chick is unassimilated because of the fact that this chick was fed too soon, as is shown by the fullness of the crop and gizzard.

Cleanliness on the part of the feeder means much for good health. He should use clean feed, and feed it in clean litter and in clean hoppers or feeding troughs, and should see that the drinking vessels are scalded and disinfected. Disease germs thrive in filth.

The first four weeks of a chick's life is the most dangerous period.

If it passes this the danger grows less from that time on. The hard struggle for existence begins about the third or fourth day after incubation and continues from two to four weeks.

The secret in feeding baby chicks is in knowing how to feed them so they have enough food to satisfy them at each meal, and then have them appear hungry when the next feeding time comes.

It is generally true that if chicks are fed too soon before they have digested the yolk of the egg which they absorb, that it will cause the yolk to remain undigested, and it will become hardened and finally kill the chick. This is often true, and it is also true that because the incubator has been run so high that the egg has become overheated and the yolk becomes baked and hardened, and when absorbed by the chick makes it indigestible, and, therefore, causes the chick to dwindle and die. We prefer to run the incubator a degree or so too low in preference to having the eggs overheated.

The little chicks, like little children, require lots of sleep when first hatched. They should be put in comfortable quarters and kept quiet for the first few days. Let them out a short while at feeding time.

When you place the little chickens under the hover they will be quiet for a while, but will soon become inquisitive, and you will want to

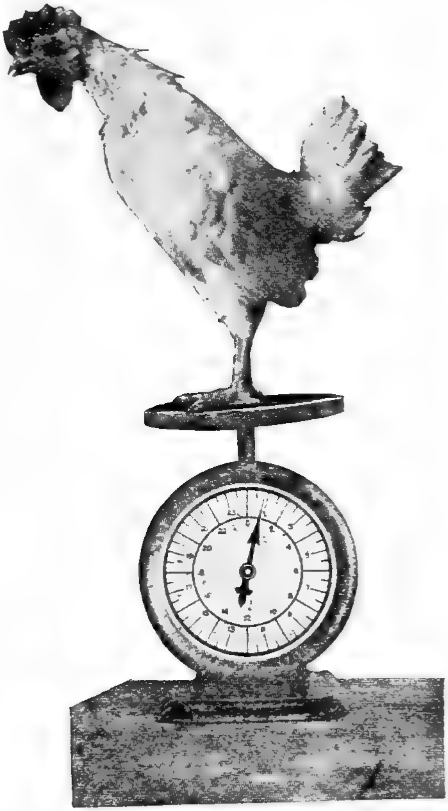


Fig. 54. This shows a cockerel only seven weeks old weighing seven-eighths of a pound, yet so full of vitality that he is crowing and attempting to tread pullets when less than two months old. The ancestors of this cockerel had been selected and bred for several years for egg production.

feed them. Do not feed them for 24 to 48 hours after they are hatched or they may get digestive troubles. They do not need food for many hours, but if you are tender-hearted and must feed them do not do so for at least twenty-four hours, because those little chicks are provided by nature with a lunch basket. Just before the chicken leaves the egg the yolk is taken into the abdomen and it is healed over. This provides food enough for practically a week if it was forced to do without other food for that length of time.

The little chicks come out in the sunshine and enjoy it but when a cloud comes up they do not know where to go. The hover doesn't cluck; you can't make it cluck. The biggest, brightest chicks crowd together and pile up. The others crowd around them and the ones beneath are suffocated. The protecting care of the mother would have saved these little orphans. If you push them back into the hover half a dozen times they will learn to go there themselves.

### THE MINERAL ELEMENT IN POULTRY FOOD

Perhaps no part of the mash is so often neglected as the mineral element of chick foods. All grains contain more or less ash and mineral matter, but the average food is deficient in meeting the needs of the chick, which is growing rapidly and requiring a great quantity of building material for bones. Slow growth and uneven development usually result. Bone meal or finely cracked bone is very essential. This should be mixed in the mash in addition to feeding chick grit and charcoal. Beef scraps, fish scraps, granulated milk, fresh meat, skim milk and buttermilk are all good, but bone meal should be supplied in addition. We use about five pounds of fine bone meal to each 100 pounds of dry mash.

### CAUSE OF CROOKED BREAST BONES

Poultrymen usually attribute crooked breast bones to the fact that such chickens began to roost on poles too early in life. The weight of the body resting on the poles, they imagined, caused the breast bone to be deformed. We are inclined to the belief that this, in a large majority of cases, is due wholly to the lack of sufficient ash and mineral matter in the food. These elements were lacking to such a degree that the bones did not grow and develop as they should, but became deformed. We have seen chickens roost continuously upon a bed of straw until they were practically mature and yet they had crooked breast bones, and again we have seen chicks begin to roost on poles very early in life and it was very seldom that you found a chick with a deformed breast bone. After experimenting and after considerable observation, we believe that the fault is in the fact that there is insufficient ash, mineral matter and bone building material in the food given chicks.

### THE COST OF RAISING CHICKS

Different associations and poultrymen vary greatly in their estimate of the cost of producing chicks. It all depends upon the cost of the feed, the cost of the eggs or chicks, the expense of labor and care in feeding, and the percentage of chicks raised. The reports on the cost of feed for raising chicks for the various institutions are as follows:

| | |
|---|---|
| England, University College, Reading. | |
| To 13 weeks— | |
| White Wyandottes | 14.2 cents |
| Buff Orpingtons | 13.5 cents |
| Faverolls | 13.7 cents |
| Cross-breeds | 12.3 cents |
| Maine, Agricultural College—Barred Plymouth Rocks— | |
| To broiler size (about 2 lbs.) | 16.5 cents |
| Pullet, to laying | 48.0 cents |
| North Carolina, Experiment Station—Different breeds— | |
| To 8 weeks | 5.1 cents |
| New York (Geneva) Experiment Station—Different breeds— | |
| To 10½ weeks | 13.0 cents |

New York (Cornell) Experiment Station—White Leghorn—
To 8 weeks ........................................ 5.2 cents
Ontario Agricultural College—Different breeds —
Four-pound cockerel, raised on range in a cornfield test....21.0 cents
These estimates do not include the cost of labor or of hatching.

Because of the unusually high and abnormal prices of food stuffs which have prevailed during the past two years, it is difficult to figure the cost of feeding poultry and present figures that are of much value. For three years accurate figures have been kept by Prof. Lester E. Card of the Connecticut station, of the cost of producing chicks. The following figures show the amount of food and the length of time required to produce growth with Leghorn and Rhode Island Red chicks.

| Growth | Leghorns | R. I. Reds |
|---|---|---|
| 1st lb. | 7½ weeks 3.2 lbs. feed | 6½ weeks 3 lbs. feed |
| 2nd lb. | 5½ weeks 4.5 lbs. feed | 3½ weeks 3.2 lbs. feed |
| 3rd lb. | 6 weeks 7 lbs. feed | 5½ weeks 6.5 lbs. feed |
| 4th lb. | | 5½ weeks 10 lbs. feed |
| 5th lb. | | 10 weeks 18 lbs. feed |

Prof. Card found that it cost 47 cents each to produce Rhode Island chicks eight weeks old in the spring of 1917. He gives these interesting figures:

| | | |
|---|---|---|
| 620 eggs at 7c each | | $43.40 |
| Incubation at 2c per egg | | 12.40 |
| 178 lbs. scratch feed at $2.50 | $ 4.98 | |
| 236.5 lbs. chick feed at 5c | 12.50 | |
| 418.5 lbs. dry mash | 11.13 | |
| 963.6 lbs. milk at 50c per 100 | 4.82 | |
| Total cost of feed | | $ 33.43 |
| Labor cost, 60¼ hours at 20c | | 12.05 |
| Coal, 777 lbs. | | 2.50 |
| Total cost | | $103.78 |

The 620 eggs produced 300 chicks and there were 221 raised to eight weeks of age.

The food consumption for 10 chicks per week was as follows:

| | R. I. Reds | Leghorns |
|---|---|---|
| 1st week | 1.27 pounds | 1 pound |
| 8th week | 10 pounds | 8 pounds |
| 16th week | 15 pounds | 12 pounds |
| 24th week | 18 pounds | 15 pounds |
| 32nd week | 18 pounds | 16 pounds |

After the birds are four months old they eat individually from 1½ to 2 pounds of feed per week.

## THE COST OF REARING YOUNG CHICKS

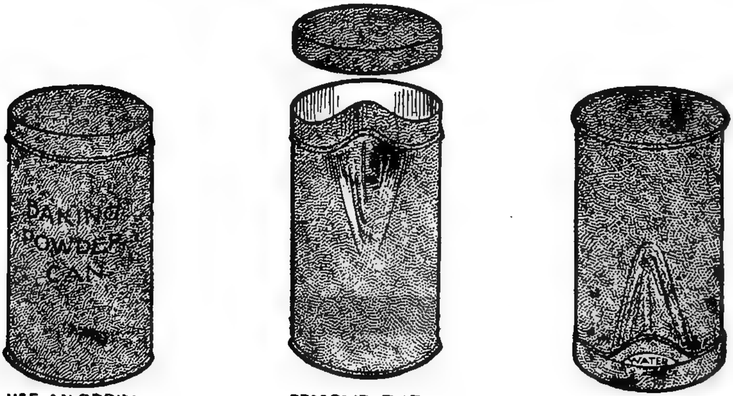
Professor Graham of the Canadian Experiment Station of Guelph, Ontaria, placed flocks of four hundred chickens in colony houses in various portions of his farm in order to determine the cost of raising chicks amid these different surroundings. Each flock consisted of one hundred Barred Rocks, one hundred Rhode Island Reds, one hundred Buff Orpingtons and one hundred Leghorns. Four hundred of these chickens were kept in a pasture while the colony houses were located in the shade of a clump of evergreen trees where the chicks were protected from the heavy winds. When the chicks were about four months old one pound of chicken meat had cost 3.6 pounds of grain and the average weight of all, including the Leghorns, was about four pounds each. The grain and mash were both hopper fed and in a general way they consumed a quarter as much mash as they did of the whole grain. The average grain consumed per bird was about twelve and one-half pounds.

In the orchard there were 773 birds that consumed 8,649 pounds of supplied food. These chickens weighed practically 3 1-3 pounds each. This made each chicken represent about 11.2 pounds of grain consumed. Two-fifths of the birds in the orchard were Mediterranean breeds.

The amount of food consumed by the chickens kept in the corn field and the grain which they ate is not available. Prof. Graham stated that the figures were too small for the general public to believe. We understand that it requires less than three pounds of grain to produce a pound of chicken flesh where the chicks were kept in the corn field. They grew more rapidly and were remarkably cheap. He seems convinced that chicks can be grown cheaper and more rapidly on cultivated ground than on sod and the results were really surprising.

## HOME-MADE DRINKING FOUNTAIN

The best home-made fountain we have ever been able to find for baby chicks, for the first three or four days at least, is that which can be made in every farm home. Take an ordinary baking powder can and soak it in water until the paper label on the outside can be removed. Scald it and clean it thoroughly. Remove the top and press in one side of the can, as shown in this illustration herewith. Then fill the can with water, put on the top and turn the can upside down. The water in the can will not waste or spill out in the coop or brooder, the chicks cannot get into it and get themselves wet and chilled, and they do not get litter or filth in the water as they do with most methods of supplying drinking water. Try the plan; you will like it.



USE AN ORDINARY BAKING POWDER CAN

REMOVE THE TOP AND PRESS IN ONE SIDE WITH YOUR THUMB AND FILL WITH WATER.

THEN TURN CAN AND ALL UPSIDE DOWN.

Fig. 55. A splendid little drinking fountain for small broods of baby chicks. These are all right for small flocks for the first week, but they usually require a larger fountain after that time.

## WATER IS CHEAP AND IMPORTANT

Neglecting the drinking pan, especially during warm weather, and allowing the chicks to go without water, sour milk or buttermilk during the dry hot days of summer will cause greater injury to the young than the lack of sufficient food. Also the use of stale, dirty and stagnant water will often lead to a complication of chick diseases and digestive disorders. Water is very cheap in price and it is pure neglect on the part of the poultryman to allow his chicks to suffer for want of water. A man who neglects to keep fresh water before his chickens at all times does not deserve to succeed. Moisture is an absolute necessity in the life of the young chick for the following reasons:

(1) To soften the food in the crop; (2) to dilute concentrated food; (3) to regulate the temperature of the body; (4) to aid in the digestion and assimilation of the food; (5) to carry nourishment throughout the body; and (6) to carry waste out of the system.

## THE VALUE OF SOUR MILK FOR FEEDING LITTLE CHICKS

"The feeding of milk to young chicks has a most favorable influence on the growth and on the lessening of mortality of the chicks. It tends to prevent mortality from all causes, and if fed soon enough and for a sufficiently long period, greatly reduces the death rate caused by bacillary white diarrhea.

"Sweet and sour milk are apparently of equal value in the relation to growth and mortality. Furthermore, different degrees of souring do not alter the results of milk feeding.

"The value of milk as a food for chicks does not depend upon any acids that may be present, nor upon any particular types of micro-organisms; but upon one or more of the natural constituents of the milk.

"When milk is supplied freely to chicks it becomes all the more important that they have abundant exercise. This applies more particularly to early hatched chicks that are brooded wholly or for the most part indoors.

"The feeding of sweet or sour milk to young chicks has in no instance been found to be in any way injurious to the chicks employed in our numerous experiments. If the milk is clean, and not too old, none but the most favorable results should accompany its use as a food for chicks. There is no preference in the choice of sweet or of sour milk except from the standpoint of convenience. The use of the one or the other should be determined by the circumstances. However, it seems very desirable that the same kind of milk be supplied throughout the milk feeding period. If the choice is that of sour milk, sour milk should be fed to the end."

In feeding milk to young chicks the drinking vessel should be protected in some way so that the chicks cannot get into it with their feet and thus soil the milk besides smearing the milk over their heads and breasts. If they are allowed to do this it sometimes gets into their eyes and will cause inflammation.

One of our students states that: "While we are on the subject of sour milk or buttermilk as a preventive of white diarrhea, I would suggest that your school experiment on milk curd, as is used for making cheese. When milk has turned sufficiently to curd, pour off the water, place curd in cheese-cloth bag and squeeze out every particle of water until it is dry. This being done, adopt the prescribed formula for first week, or even longer, as recommended for chicks, adding curd to make a complete mash. Give fresh sour milk or buttermilk every morning in fountain that has been formerly scalded and made sweet and clean."

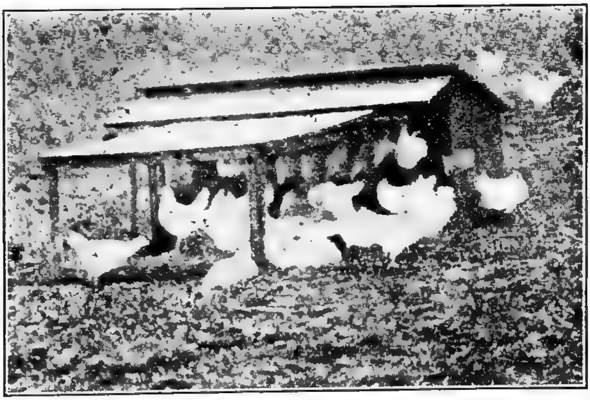


Fig. 56. If you haven't the natural shade, then provide shade in much the same manner as above.

When the young chick reaches the age that you can tell the cockerels from the pullets, the sexes should then be separated. You will injure and retard the growth of some valuable pullets if you allow them to be continually treaded by vigorous cockerels.

## PROVIDE SHADE FOR THE CHICKS

Much of the loss of young chickens in summer months can often be traced to the lack of shade. If the young stock is not protected from the hot sun on a summer's day the chicks are certain to be dwarfed to a great extent and deaths are sure to result.

The drinking vessel should be kept in the shade and the fowls given protection from both sun and rain. If you do not provide for a corn field near the poultry yards, then sow some sunflower seed, set out some cherry trees, or place grape vines around the fences surrounding the poultry yard, or provide shade in some other way that will not detract from the appearance of your place. You had just as well grow a crop of grain or a crop of fruit on land on which you raise poultry as not.

If you cannot provide shade in any other manner, drive some stakes and cover them with a light frame, and on this tack some burlap, canvas, or something of this nature. This will give the birds a comfortable resting place on a hot summer's day.

Good, cool shade is absolutely indispensable. Give the chicks plenty of range, an abundance of water, and do not let them crowd in the colony houses. The results will please you.

## FREE RANGE AND FRESH GROUND

If chicks are expected to grow husky and get the most out of life for themselves and their owner, it is necessary that they be properly brooded, be given plenty of range and be grown on fresh soil. This will be discussed fully under "Natural and Artificial Brooding" and the various systems dealt with in detail. It is enough for the present to say that you will make no mistake in placing your colony houses along the edge

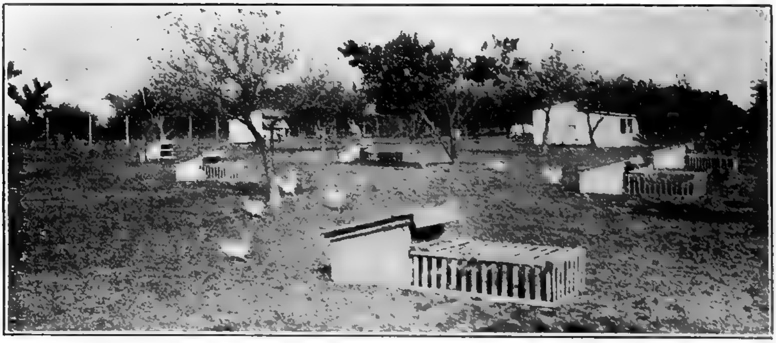


Fig. 59. Scenes on the grounds of the Missouri State Poultry Experiment Station where growing stock is given free range and fresh ground, which are conducive to good health. A crop of wheat, a crop of apples and a crop of chickens are all grown on the same ground.

of a corn field, in the orchard, in a clover field, in a growth of sunflowers, in a blue grass woods pasture or some other convenient spot about the farm where the chicks can have fresh ground to range over, ground which is well drained and can be sweetened by cultivation or by growing some grass or grain.

## PURIFY YOUR YARDS

On small plants where the yards are small and numerous and the area of land quite limited, cleanliness is one of the first essentials to the raising of chicks successfully. If all poultrymen would clean and lime their yards, pens and runs with air slacked lime, there would be less danger of chick diseases. The yard should be scraped in summer and the refuse used as a fertilizer in gardens and around flower beds. Air slaked lime acts as a disinfectant and purifies the soil.

## IDEAL RANGE FOR CHICKENS

Very often one-inch mesh wire netting from one to four feet high can be stretched across a portion of your garden and thus protect the tender plants and berries from the chickens, but allow them to have the remainder over which to range. This should be made for only a temporary fence, but the chicks will be greatly benefited by this range, and the garden will be enriched. Sometimes it is a good idea to plow or spade up a portion of the garden and sow it to wheat, barley or oats, and then allow your chickens to range over this. If the grain is sowed unusually thick and allowed to sprout, you can take a spading fork and dig up a few forks of the earth, which turns up the sprouted grain and lots of worms. Ten minutes digging each day will give your chickens a lot of feed and fun in hunting these tender morsels.

## DISEASES OF BABY CHICKS

Should the chicks become diseased, examine your methods of management, your premises, your houses, your feed, etc., and remove the cause. Clean up the premises, whitewash and disinfect the houses and scald the drinking vessels. In case your chicks become seriously sick, unless it is a very valuable bird, the best remedy is to crack their necks and burn their carcasses. There is one rule which should be adopted by every farmer and poultryman, and that is, never allow a bird to die on your premises. Kill it and burn the carcass before it reaches that stage.

## SOME OF THE CAUSES OF DISEASE

It is a mistake to try to keep too many chickens in one flock in a small house. It does not pay to crowd them, young or old. Dampness and drafts must not be permitted in a poultry house. Never allow your

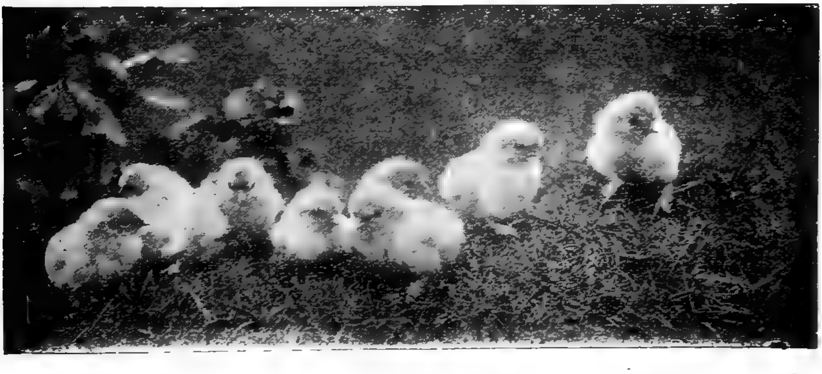


Fig. 60. Proper methods will tend to make a weak chick strong and a strong chick stronger. Improper methods will tend to make a strong chick weak and a weak chick weaker. The above beautiful baby chicks show that they are full of life and vigor. Improper methods of brooding, feeding or care would cause the loss of every one of them.

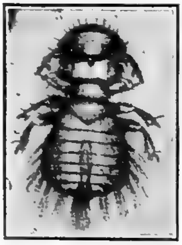
poultry to eat decaying meats or diseased animals that have died on the farm. Filthy drinking vessels are the cause of many serious ailments in the poultry yard. They should be scalded or disinfected every few days. The fight must be constant against vermin, to stop the mites and lice before they get started. Poorly constructed houses or coops which are damp, with insufficient ventilation, sunlight, etc., are detrimental to the health of the chicks. Damaged food and musty grains, the amount of feed, the variety and method of feeding, all affect the health of the chicks. Unsanitary surroundings, impure water, neglect and want of exercise often cause chicks with strong, sound constitutions to break down. All of these things can be prevented, and ordinarily if chicks become seriously ill, it is caused by inexperience or neglect of the poultryman himself. In all cases, where disease is noticed the sick birds should be isolated until the nature of the disease is determined. When writing to know a remedy for your sick birds always state how they are housed, what they are fed and how much, and describe the actions and condition of the sick birds. Give all the information possible.

## AVOID CROWDING

One of the chief causes of death in young chicks is the result of overcrowding. Chickens cannot sweat as they have no sweat glands in the skin, therefore, the impurities and moisture must be crowded out through the breath. If the chickens are overly crowded and there is not sufficient ventilation in their roosting quarters, the air becomes filled with impurities and laden with moisture, which places an unusual strain on the system of the bird in many ways, especially upon the kidneys, which results in a weakened system. If the chickens come from the coop in the morning, weak and tottering, and with no appetite, this accounts for much of the lack of vitality which we find in many flocks.

## LICE AND MITES

Keep the inside of the coops and cracks and crevices of your brooders painted with a solution of two or three gallons of coal oil to one gallon of crude carbolic acid. If the chicks are troubled with the head lice, sprinkle a little Persian insect powder on their heads and underneath their wings. For body lice on fowls and head lice on chicks, use 33 1-3 per cent blue ointment formula and mix an equal amount of lard with the ointment. Mix it thoroughly. You can buy this at any drug store. Apply a small portion about the size of a pea just below the vent and in the fluff of the hen and rub thoroughly next to the skin. This will kill the body lice upon the hen and the head lice upon the little chicks, as the little chicks will get sufficient upon the feathers by nestling under the hen. Never rub the pure blue ointment on the head of the chicks or you may kill them. Some use grease or olive oil upon the heads of the little chicks. Gasoline will also kill head lice, but must be used with care or it will kill the chicks. One of the best things we have used is 20 drops of refined carbolic acid, 3 teaspoonfuls of kerosene and 12 teaspoonfuls of olive oil thoroughly mixed. Take just a drop or just what will stick to the end of your finger and rub it on the head of the young chick, and just a little on the under side of the wing and this will rid the chick of head and body lice. For mature birds use the same mixture by rubbing some of it into the feathers so that it reaches the skin just beneath the vent, and do the same in the fluff on each side of the bird and you can rid a mature bird of body lice. Use only half the amount of olive oil if used on mature fowls.



**A Chicken Louse**

Fig. 61. Troublesome pests which can and should be avoided.

Use the mixture of crude carbolic acid and coal oil freely in hot weather to prevent the appearance of mites. Keep the coops and brooders clean. By spraying the houses with a solution of five parts water and one part commercial lime sulphur you can rid your houses of lice and mites. Spray it until this solution runs and drips from the walls.

Crude oil painted on the walls, roosts, nests, cracks and crevices, will help in keeping down lice and mites.

### CONTROL LICE AND MITES

There is nothing that is more detrimental to the health and growth of young chicks than to let parasites gain a foothold in your flock. If you notice them becoming listless, their combs and wattles becoming pale in color and the young birds losing in weight, we advise making an examination of such birds and also your houses and coops to see if you can discover evidences of either lice or mites. Chicken mites are one of the worst pests found in the poultry yard. The growth of the young chickens depends upon the digestion and assimilation of nourishing food. The blood carries this nourishment to the various portions of the body, and, as long as mites live upon the body of the chick and remove the blood as fast as it is made, there is little chance of growth. There is great danger of mites, especially in the warmer sections of the country. All coops and perches should be regularly examined and brushed with a solution of two to three parts of kerosene mixed with one part of crude carbolic acid.

### DIARRHEA

The ordinary case of diarrhea is usually caused by one of the following reasons: Lice and mites, uncleanliness, dampness, crowding, lack of shade, foul water, overdoses of pepper and condition powders, too much meat or ground bone, or tainted meat, exposure or overeating.

When cases are first noticed take all feed from the birds for several hours, allowing only pure, fresh water. About the only treatment necessary in most cases is to discover the cause and remove it. The bird should be fed lightly for a time and a little powdered charcoal mixed in their food. If the birds are valuable and demand individual attention, give each one-third to one-half teaspoonful of castor oil at the beginning. Begin feeding with boiled milk or curd, to which is added a liberal supply of powdered charcoal. If you haven't the milk, well cooked oatmeal or wheat rice will answer. To this add the charcoal. Feed about three times a day and return to the regular rations gradually. Disinfect the houses and runs where such birds have been kept.

### WHITE DIARRHEA

This is the cause of loss of more chicks than all other diseases combined, and up to the present time there is a great difference of opinion as to the exact cause of white diarrhea, and no effective remedy has yet been discovered. The trouble can be avoided to some extent by having breeding stock of strong vitality and by raising the chicks on fresh, sweet ground. Perfect disinfection and cleanliness of brooders or brood coops is absolutely necessary. The use of a liberal amount of good soil in the brooder, covered by a fine absorptive litter, such as shredded alfalfa or alfalfa meal, should be used. Food and water should be applied in such a manner as to prevent contamination from the droppings.

Prevention must be the main reliance in dealing with white diarrhea. Chicks are frail creatures during their early life and cannot endure a vigorous course of treatment, and the strong medicines necessary to destroy the effects of the disease will usually kill the chick. As this is the cause of so much loss we have devoted a great deal of space to it.

**Symptoms**—Some of the chicks may die a few days after hatching. Some will be pasted up behind and others may show no visible symptoms except weakness and lack of vitality. Perhaps the best work which has been done to date on this disease, which claims hundreds of thousands of chicks each year, has been done by Prof. L. F. Rettger of Yale University, Prof. F. H. Stoneburn, formerly of the Storrs, Connecticut Experiment Station, and Prof. W. F. Kirkpatrick of the same institution. We quote from their bulletin No. 68, as follows:

:The characteristic discharge from the vent soon makes its appearance in the flock, the time depending, without doubt, upon the virulence of the organism and the mode of infection. The discharge may be slight or profuse, in order white or creamy sometimes mixed with brown. The voided matter has a more or less sticky or glary character. It may simply streak the down below the vent or may cling to the down in sufficient quantity to seal up the vent. This is the condition that poultrymen designate as "pasting up behind." This latter condition, however, is not necessarily indicative of white diarrhea.

The chicks soon become listless and sleepy, inclined to huddle together and remain under the hover much of the time. They seem to lose appetite and do not eat much. Frequently when they attempt to take food their action is more or less mechanical. The wings begin to droop or project slightly from the body with feathers ruffled. In acute cases the eyes are closed and the chicks become indifferent to everything that goes on about them. Many of the chicks peep or chirp constantly, the sound being shrill or weak, according to the strength of the individual. Frequently when endeavoring to void the excreta the chicks utter a shrill twitter, apparently a cry of pain. The breathing may be labored, the abdomen heaving with each breath. Occasionally one may note a certain amount of gasping or gaping.

During the progress of the disease the chick may die suddenly while still fairly strong. When the disease is prolonged the chicks gradually waste away, becoming weaker and weaker until they are scarcely able to support their own weight. In this stage they will often be seen to rest against foreign objects for support, standing with legs braced apart, squatting or lying utterly helpless.

With few exceptions the deaths from typical bacillary white diarrhea occur while the chicks are under one month of age. After this a few straggling deaths may be expected, and if complications set in a high mortality may be observed. The chicks which have had bacillary white diarrhea seem to be greatly weakened in constitution and fall an easy prey to disorders which would be resisted easily by normal chicks. Those which survive remain more or less stunted in their development. Frequently they are misshapen, with long back and "crow heads" and with imperfect featherings. In every way they impress one as being weak and lacking in vitality. This condition may persist indefinitely or the bird may slowly regain vigor and vitality and finally make fairly satisfactory development.

Fig. 62. Millions of chicks die each year from this one disease. One chick in a brood affected with this fatal disease may carry or spread it to hundreds of other chicks which were healthy.

**Summary**—In order to avoid possible confusion we have applied the term bacillary white diarrhea to that form of disease of young chicks which is caused by bacterium pullorum. This is the disease commonly called white diarrhea by the poultrymen in New England.

1. The original source of infection is the ovary of the mother hen.
2. Eggs from infected hens contain the organism in the yolks.

3. Chicks produced from infected eggs have the disease when hatched.

4. The disease may be spread through the medium of infected food and water. Hence normal chicks may acquire it through picking up infected droppings or food contaminated thereby.

5. Infection from chick to chick cannot, apparently, take place after they are three or four days of age.

6. As a rule, infected chicks make less satisfactory growth than those that are apparently normal. For some time they appear stunted and weak, but may eventually undergo more or less complete development.

7. The female chicks which survive often harbor the infection and may become bacillus carriers. Infection in the breeding pens is perpetuated in this manner.

8. In all probability infection does not pass from adult to adult.

9. Infected hens are apparently poor layers, especially in their second and subsequent laying seasons.

## PRACTICAL SUGGESTIONS

It is of the greatest importance that the poultrymen learn to recognize bacillary white diarrhea, both through external symptoms and post-mortem appearances of diseased chicks. The mere discharge of whitish material from the vent is not in itself proof that the chicks are affected with this specific disorder.

Infected hens should be eliminated from the breeding pens. Such elimination is made possible by pedigree records of chicks. If the eggs from the different pens are hatched separately and the chicks segregated for the first few days it will soon be made apparent through the condition of the chicks which pens contain infected hens. This may prove effectual in cases where infection has not become general. To determine which individual hens are infected the trap-nest should be used and the same general procedure followed.

In case infection exists and it is not practical to determine the breeders which are infected, the entire flock should be discarded for breeding purposes and eggs for hatching secured from a non-infected farm. We have records of farms where the disease has been eliminated in a single season by following this plan and without any change in equipment or methods.

Another possible means of determining infection of breeding hens is the direct examination of the ovaries. It is entirely practicable to inspect these organs through an opening in the side of the bird similar to that made in caponizing. Where the abnormal condition is marked it may be easily detected.

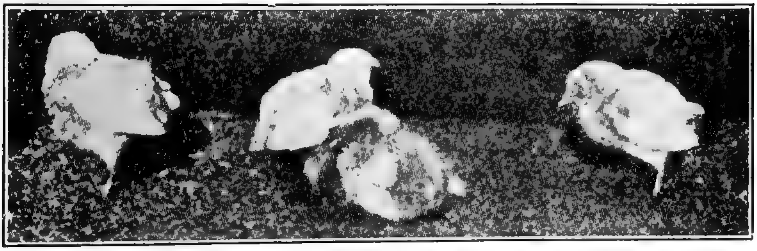


Fig. 63. Chicks affected with white diarrhea paste up behind as a rule, they lose their appetites, become inactive, their wings droop, and the chicks stand with their eyes closed.

Great care should be exercised that breeding stock, young chicks, or eggs for hatching be secured from flocks which are free from white diarrhea infection.

As to the means of preventing the spread of infection from chick to chick, segregation of chicks during the first four days after hatching should prove effective. It is entirely probable that keeping chicks in small groups in the incubator for forty-eight hours after hatching will materially reduce the chances of a few infected individuals spreading the infection through the entire hatch. For division into small groups we suggest the use of pedigree trays, wire baskets or bags made of mosquito netting. Naturally, the smaller the group the less the chance of spreading the infection.

From the time the chicks begin to hatch until they are removed to the brooder the incubator should be kept dark. This will largely prevent the chicks from picking at the droppings.

Since infected chicks make unsatisfactory development for the first few weeks, and may later regain vigor and make fair growth, it is advisable to select at an early age those intended for breeding purposes. The selection may be made when the chickens are from eight to ten weeks of age, reserving only those which show greatest vigor and development.

Incubators, brooders, and all other appliances used in the hatching and raising of the chicks should be cleaned and disinfected frequently.

Food and water should be supplied in such a manner as to prevent contamination with infected droppings. The use of fine absorptive litter in the brooder, especially for the first few days, is also advisable.

The feeding of sour milk may prove very effective as a preventive measure. The milk must be fed early, or during the infection stage. After the white diarrhea organism has once entered the general circulation such treatment is of little or no value. Hence sour milk should not be looked upon as a cure, but merely as a possible preventive agent.

Since perfect physical condition is, as a rule, a barrier to disease, it is important that the health and vigor of the breeding stock and chicks be raised and constantly preserved. Proper methods of housing, feeding, incubation, brooding and management should therefore be employed.

Rettger, Stoneburn and Kirkpatrick have this to say in their third report:

## GENERAL CONSIDERATION OF THE SOUR MILK PROBLEM

That the feeding of sour milk to chicks which are exposed to or are suffering with white diarrhea infection is beneficial is indicated clearly in the results of the foregoing experiments. In every instance the mortality was lower in broods which received sour milk than in the corresponding broods that did not. In several of the experiments the number of deaths in the pens which were not supplied with sour milk was at least double that of the pens which received it, and in one case the ratio was approximately 3:1. It should be understood that where sour milk was used it was given to the chicks early in life and kept constantly before them.

Further investigation will be necessary to determine whether the beneficial action is due to the acid in the milk, as would be claimed by supporters of the Metchnikoff theory, or to the growth-and-vigor-stimulating properties of the milk. It is desirable to continue the experiments recorded here and to acquire more complete data on this phase of the sour milk problem.

The most surprising results which have been obtained in our feeding investigations are those which bear on the growth and vigor of the chicks. There was a constant gain in the weights of the chicks which were fed the sour milk over the corresponding broods which were not. At the time of this writing the average weights of the former are fully double those of the other groups. Not only is this difference most apparent in the pens which were infected, but also in the check or control pens.

Besides the difference in weights there were other important marks of difference in growth and vigor. The sour milk chicks were of more nearly uniform size than the others, and they appeared more rugged almost from the beginning. Furthermore, the combs of the males were larger and of brighter color; the flesh of the sour milk chicks was more firm, and the limbs appeared to be stronger and better developed.

The males in the sour milk pens began to crow earlier than the others.

When one of the feeding experiments had been under way for about four weeks our attention was directed to an unusual condition in the open yards or runs. In yards 2, 4 and 6 (all containing chicks which had not received sour milk) there was not a green blade of grass left standing, while in 1, 3 and 5 (sour milk pens) the grass was as green as a lawn. It appeared at once evident that the sour milk supplied certain food elements which are essential to the normal development of growing animals, and which are found in green foods.

Should our future feeding experiments fully corroborate the results which are covered in this report, sour milk will have to be regarded as a most important agent in the prevention of bacillary white diarrhea, either by virtue of its inhibitive action on the bacillus of white diarrhea in the crop and intestines or because it greatly increases vigor which in turn enables the chicks to throw off the disease successfully. It is quite probable that in sour milk we have an agent which will be most effective in fostering growth and vitality. In so far as white diarrhea is concerned sour milk may be employed to great advantage in preventing epidemics in stock which is but slightly infected or where there is some doubt as to the probability of infection—that is, in cases where it seems impracticable or undesirable at once to replace the old with sound new stock. It should not be regarded, however, as a sure means of ridding a flock of white diarrhea infection.

It is of great importance to determine whether the beneficial action of sour milk which has been noted is due to the acids present or to the condition of souring, or whether ordinary sweet milk has the necessary ingredients to bring about the same results. It has been shown that sweet milk, even in very small amounts, has a most stimulating effect when fed to rats which have been kept on certain restricted diets.

It should be stated here that the chicks which received the sour milk appeared to consume more of the regular feed than those which did not have access to the milk. The feed was not weighed, however, so that our data on this point are not as definite as might be wished.

## IMPORTANCE OF BREEDING FROM SOUND, UNINFECTED STOCK

For the prevention or elimination of bacillary white diarrhea the eggs used for hatching must come from sound, uninfected stock. This appears to us to be the key to the whole situation. The ways in which white diarrhea may be detected in a flock have already been described in previous bulletins. Since the supply of those reports will soon be exhausted it seems desirable to restate them here and to add what is of further interest.

## SYMPTOMS AND POST-MORTEM APPEARANCES OF BACILLIARY WHITE DIARRHEA

As in many other diseases, the symptoms may vary within certain limits in the individuals affected. We do not wish to be understood that all the following symptoms will be observed in every chick suffering from bacillary white diarrhea, but almost all of them will be apparent in epidemics of any considerable size.

The earliest deaths may occur within a very short time after hatching without any prominent symptoms, excepting perhaps weakness and lack of vitality.

Frequently the chicks take on the appearance which poultrymen call "Short-backed." The back seems to shorten and the abdomen to protrude out of proportion, causing the chick to look "stilty" as compared with one of normal development. This condition Woods accurately describes as follows:

"The weakling is almost always big bellied, the abdomen protruding to the rear so that it bunches out behind, well out of line with the vent, with the reuslt that the chick looks as if the tail-piece and backbone had been pushed forward and in just above the vent."

In post-mortem examinations, the usual method of autopsy has been followed here, the chick being placed on its back on a board, the outstretched wings and the legs tacked in position, the skin covering the breast and abdomen removed and the intestinal organs exposed to view by the removal of the entire breast-bone. In typical cases the following conditions are found:

**Crop**—Empty or partially filled with slimy fluid or with food.

**Lungs**—Apparently normal. (Tubercles not observed.)

**Liver**—Pale, with streaks and patches of red. The congested areas are usually large in size. Occasionally epidemics will be met with in which the liver is more or less congested throughout. In such cases the portion of the stomach lying in contact with the liver is inflamed.

**Kidney and Spleen**—Apparently normal.

**Intestines**—Pale, and for the greater part empty. A small amount of dark grayish or brownish matter frequently present.

**Caeca**—With few exceptions partly filled with a grayish soft material. Only occasionally cheesy or firm contents.

**Unabsorbed Yolk**—Usually present, varying in size from a pea to a full sized yolk. The color may vary from yellow to brownish green or nearly black. In consistency there is also much variation. It may appear perfectly normal, distinctly gelatinous, or watery. Frequently it looks like custard and again it is more or less dry and firm. Unless the chick has been dead for some time the yolk is not putrid, but merely stale.

The chick as a whole appears more or less anaemic and emaciated. The muscles of the wings, breast and legs may be almost completely wasted away.

## DETECTION OF WHITE DIARRHEA INFECTION IN A FLOCK BY THE EXAMINATION OF THE OVARIES OF LAYING HENS

One of the most important methods of determining whether a certain breed or stock is infected with the organism of bacillary white diarrhea is the direct examination of the ovaries of mature hens. Whenever hens are killed and prepared for the market, careful examination of the ovaries should not be overlooked. The most unskilled operator need have no trouble whatever in recognizing a white diarrhea ovary when the disease has made any real progress.

A normal ovary which is undergoing natural development is made up of numerous ova of varying sizes. Some of the ova may be as large as a normal yolk; on the other hand, there are hundreds of very minute ova most of which cannot be seen by the unaided eye. A large number of small ova may be seen as colorless, round objects which resemble tapioca grains that have been soaked in water until they are transparent, only they are much smaller. The color of the developing ova varies from a light yellow to a rich normal yolk color.

In striking contrast to the above, a typical white diarrhea ovary may be described as being made up of ova of two distinct types, the noraml and the abnormal. The normal may be of varying sizes and resemble those of perfect ovaries. The abnormal may also vary as to size, but often as many as twelve or more ova which are of uniform size may be seen. When quite small the white diarrhea cysts are less angular and irregular than those which are larger. The color of the larger ova may vary greatly; they are usually more or less mottled. Some are light in color; others much darker; almost all shades of yellow and brown may be seen. Occasionally the color is so dark and of such a character as to suggest gangrene.

The larger abnormal ova or cysts are usually quite angular and of a firm consistency. Sometimes they are so compressed as to appear flattened. The contents of the white diarrhea ova,are, as a rule, quite characteristic; they consist chiefly of a solid, cheesy matter which is usually permeated by a clear, amber colored fluid. The bacterium of white diarrhea may be recovered from the contents with ease.

## THE IMPORTANCE OF BACTERIOLOGICAL EXAMINATIONS IN THE DETECTION OF BACILLARY WHITE DIARRHEA

The most satisfactory method of diagnosing white diarrhea is the bacteriological. By this means the presence of the disease may be determined in chicks by examining them for bacterium pullorum. Infection in the laying stock may be detected by the bacteriological examination of eggs and ovaries. The examination of fresh eggs for the organism is far less practical than the examination of incubator eggs.

The practical poultryman does not have the necessary training or facilities to make scientific tests; but it is to be hoped that it will not be long until the different experiment stations throughout the country, as well as private laboratories, will be equipped to make such examinations whenever they are called upon to do so.

When dead chicks are sent to a laboratory for examination they must be sent soon after death—that is, before any decay has set in. Furthermore, it is necessary that they be packed in ice. A most satisfactory way of packing them is to place them in a tin coffee can and to pack the can (with tightly fitting lid) in a small wooden box containing sawdust and several pieces of ice. Ovaries and other organs may be sent in the same way. It is absolutely necessary that the chicks reach their destination in a good state of preservation.

When eggs are sent to be tested at least a hundred should be shipped. The eggs should have been incubated for at least a week; in fact the most desirable are those which have been incubated two or three weeks and which have been rejected as infertile, dead or otherwise incapable of hatching. Broken or pipped eggs should not be included. Incubated eggs are examined more easily and more quickly than fresh eggs. Furthermore, by taking the rejected eggs the chances of finding bacterium pullorum are much greater, inasmuch as the organism is more apt to be found in eggs which fail to hatch. Finally, there is little or no financial loss in using such eggs for the tests.

There is no doubt that white diarrhea may be eliminated from a poultry farm when it is once known to exist. Unless the stock is extremely valuable the system of trap-nesting and examining eggs from different hens for bacterium and rejecting for breeding individual hens which are found to have infected ovaries is not a practical one. It involves too much labor and expense. Our investigation has fully proven that chickens free from white diarrhea can be raised from flocks in which the disease is known to exist. During the past year many hundreds of eggs from the station stock have been used for hatching. Only such eggs were selected as were laid by hens which had been found by the egg test to be uninfected. During the entire season not a single case of white diarrhea was observed in chicks which came from these eggs.

Fig. 64. Sour milk or buttermilk is about the best preventive and cure for white diarrhea that has been discovered to date. Nothing will absolutely prevent or cure a very large per cent of chicks so affected.

From an experimental view this is of considerable importance, but the time and expense involved make it impracticable to weed out individual hens which are carriers of the disease. On the other hand, to obtain scientific proof that there is white diarrhea infection in a flock is of greatest importance. This may be done, as already indicated, by the bacteriological examination of eight or ten dozen incubated eggs and by the direct examination of dead chickens and of the ovaries of hens.

Stock which is known to be infected must not be used for breeding purposes. Violation of this principle has often brought financial ruin, especially when eggs which are infected are sold or exchanged. It should be considered both a moral and legal offense for a person to sell eggs or day-old chicks which he knows to have come from white diarrhea infected stock. Furthermore, those who purchase eggs for hatching should do so with the greatest discrimination.

It is often very difficult to obtain eggs from untainted sources, at least where there is any degree of certainty that white diarrhea has not existed. Whoever owns a good breed of chicks and one that can be guaranteed to be free from all taints of bacillary white diarrhea, can command almost any price for eggs. This fact alone should be a great inducement to raise good flocks which are perfectly sound.

Whenever our advice to bring in new stock when the old is infected has been followed the results have usually been most gratifying. When the eggs have been obtained from farms where it was reasonably certain white diarrhea had never existed there was no more complaint insofar as we were able to find out.

It is of the greatest importance that the condition of the different poultry farms where eggs are produced for hatching be determined by thorough, systematic examination of the stock. This should be done by competent individuals or institutions. Only then will those who are endeavoring to procure sound eggs for hatching be able to attain their object with any degree of certainty and ease. There is no doubt that eggs which come from white diarrhea infected hens constitute the chief source of danger in the introduction of white diarrhea into a flock. In a certain shipment of eggs we found twenty per cent of the eggs that were tested to harbor the bacterium of the disease. On examining the eggs which came from five hens of the same flock three of the five hens were found to be infected. Direct examination of the ovaries of these hens verified the earlier diagnosis. On the other hand, of hundreds of eggs received from certain other farms none contained bacterium pullorum.

Low vitality in itself is not the cause of white diarrhea, and unless the specific organism of the disease happens to be present white diarrhea will not make itself known. We have had occasion to investigate flocks of hens which were of low vitality, as was indicated by their uneven and slow growth, their laying qualities and by the delicate character of chicks raised from their eggs. White diarrhea was absent. That the chicks were very susceptible to infection was easily shown by infecting them with cultures of bacterium pullorum. In one instance practically every chick in a group of one hundred and forty rapidly succumbed to the disease.

In order to show to what extent white diarrhea infection may affect a breeding stock, the following illustration will be of especial interest: During the past summer we visited a large poultry farm where the manager complained that it was impossible to raise any more chicks. We had already examined chicks, eggs and ovaries sent to us, and had no trouble in making a diagnosis of white diarrhea. While on the farm we examined the ovaries of thirty-two hens. Of this number twenty-six had typical white diarrhea ovaries which proved to be infected with the organism in question. The thirty-two birds had been selected at random from a flock which but a short time since numbered eight hundred hens.

Considerable care should be given the mature stock in order to preserve its vitality and to lessen all possible danger of infection. The hens should be provided with roomy, dry and well ventilated houses, and with a large run or yard which is high and dry. Every precaution must be taken to protect the hens against infection by infected hens, either by contact or through the droppings.

What has been said regarding the necessity of purchasing sound eggs also applies to the mature stock. Hens should never be obtained from a flock which is not at least reasonably certain of being free from white diarrhea infection. Where there is any question at all the new hens should be kept apart from the old until their condition is better known.

## SUMMARY

The period of greatest danger from bacillary white diarrhea lies within the first forty-eight hours. Chicks may acquire the disease, however, up to the time they are four days old.

Hens may become bacillus carriers after they have reached maturity. The ovaries may become infected by contact of the hens with infected hens or by artificial infection of the litter. The infection is in all probability acquired through the mouth.

The feeding of sour milk to chickens appears to be a good means of preventing, or at least holding in check, epidemics of bacillary white diarrhea. Hence, whenever it is impossible or impracticable at once to introduce new stock, sour milk may be an important agent in lessening the dangers of great loss from the disease. The sour milk should be fed early; furthermore, it should be kept before the chicks constantly.

Sour milk has an important stimulating effect on the growth and vitality of chicks, and, for this reason alone it is a most valuable food.

For the complete elimination of white diarrhea from a poultry farm it is necessary to reject for breeding purposes stock which harbors white diarrhea infection and to obtain eggs or live stock from sources where white diarrhea infection has not been known to exist.

It should be considered both a moral and legal offense for persons to sell or exchange eggs, chicks, or mature stock from flocks that they know to be infected with the germ of bacillary white diarrhea.

Every precaution should be taken to protect mature stock against infection by the white diarrhea bacillus. It is therefore important that mature hens, as well as growing stock, be kept in good, clean houses and large yards; that they receive wholesome food and the best of care. Finally, that they not be allowed to come in contact with infected chicks or mature stock.

## LIMBER NECK AND WRY NECK

These diseases are easily recognized, for the reason that the bird practically loses control of the neck muscles, which seem to be partially paralyzed, and the bird stands with its neck limp and arched, sometimes resting on the ground between its feet. In cases of wry neck the head is usually twisted backward and forward, and the head sometimes being turned almost entirely around. Limber neck is caused by intestinal troubles of some sort. Wry neck is thought to be a sort of epileptic disease or a direct brain and nerve trouble. Limber neck is usually easy to remedy, but in severe cases of wry neck the only thing left to do is to kill the bird. When first discovered in small chicks they should be given a dose of from two to ten drops of oil of turpentine mixed with an equal amount of sweet oil, according to their age. Prepare a ginger tea, made by mixing one teaspoonful of powdered ginger with one-half cup of hot milk and sweetened with a little sugar. Small chicks require one-half teaspoonful to one teaspoonful every hour or two. When they begin to show signs of improvement give a little thoroughly cooked rice, and follow this by feeding a limited supply of grains and pure beef scraps, and also furnish them with raw beets or a plentiful supply of raw vegetable food of some sort. When symptoms of the disease are first noticed feed very sparingly for a few days.

## GOING LIGHT

**Symptoms**—It gets its name from the rapid loss of flesh. At first you cannot notice any symptoms of the disease. You do not realize the birds have it until you find they are very thin, and you pick one up and you find the bird very light and no meat on the breast. As the disease progresses the affected birds do not follow the flock. They scarcely move about, appear sleepy, and if forced to move, stagger and fall. It may be one of several diseases.

**Treatment**—No medical treatment has been known to be effective, but you can do much to prevent it by having clean and well ventilated houses and by avoiding the use of bad, moldy grain or litter. Disinfect thoroughly. "Going light" is not so much a disease of itself as it is a symptom of some other disease. This condition is sometimes the result of internal parasites. Use the remedy recommended in the disease lesson for intestinal worms.

When a flock of young birds becomes infested with these parasites the vitality of much of the stock will be impaired and many will be lost. They cling to the lining of the stomach and intestines and they often eat holes through the part effected. They live on the food that is fed to the chickens and prevent the birds from getting their proper nourishment. Many of the losses will occur in the mornings. The bird not furnishing enough feed during the night in its intestnes forces the worms to cling to the inner linings of the itestines and the very life blood is sapped away. It soon dies from exhaustion.

There is a treatment that is recommended which is very laborious as each individual must be treated and when the flock is large it involves a big amount of time. You can take a catheter containing about a teaspoonful of oil of turpentine and insert it into the bird's throat. This is given about an hour before feeding, preferably in the morning; later follow with one teaspoonful of castor oil.

When you find infection it is better to cull out the birds that do not seem to be infected and run them on new soil. The badly infected birds will be unfit to breed from and even if saved should not be eaten. The soil in this case should also be limed and plowed and it would be better to keep the birds off for at least a year and grow some crop on the land.

The fact that we have so many poultry diseases is that so little care is exercised to keep the soil in condition. So many poultry ailments come from the soil that many failures are due to the fact that the soil is not kept sweet and clean.

The parasitic worms of the intestinal tract may be grouped as tapeworms, flukes, round worms, and thorn headed worms. The birds usually become weak and dull and isolate themselves from the rest of the flock and show signs of diarrhea. The fowls should be moved to fresh ground every two or three years. When treating diseased birds these should always be isolated and confined. For treatment of round worms the following is recommended: Dissolve in the water which is to be used for making the mash, two grains of Santonine for each bird to be treated. Mix a small amount of mash and add one-half teaspoonful of castor oil for each bird. For tape-worm, Dr. Salmon recommends the following: Mix in the feed a teaspoonful of powdered pomegranate root bark for every fifty head of birds. Also treat the yards with lime.

Remove the droppings daily from the house and keep some quick lime on the droppings board. Dissolve in the water which is used for mixing the mash one teaspoonful of Epsom salts to each bird which is to be treated. Then give a two-grain Santonine and a two-grain Calomel tablet. Keep all food away from them while giving them the Salts and the Santonine. The next day it is a very good idea to follow this with a half teaspoonful of castor oil for each bird. Repeat the above treatment in three days if the birds are badly affected.

For a treatment of intestinal worms or "going light" use that recommended and given in the disease lesson.

## GAPES

**Symptoms**—On this subjeect Dr. Prince T. Woods, in Reliable Poultry Remedies, says: "The symptoms of gapes are frequent gaping, sneezing, a whistling cough with discharge of mucous and worms, dumpishness, weakness and drooping wings. When badly affected the bird shakes its head frequently, gapes and coughs as if suffocating, droops and is not able to keep up with the rest of the flock, and stands in a dumpish position with eyes closed, wings dropped and mouth open and tongue protruding.

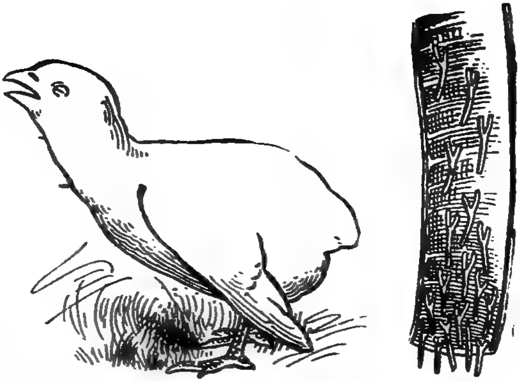


Fig. 66. · This shows the forked worm, which is in reality two worms, a male and a female uunitd. They attach themselves to the trachea or windpipe. The wings of the chick droop and it stands and gapes much in the manner here illustrated.

**Prevention**—The most desirable method of combating any disease is to adopt and persist in some reliable means of prevention. There is a cause for all ailments. Unless you remove the cause you cannot cure the disease. If the cause is removable, a serious outbreak of the disease can be prevented by proper hygiene and sanitary measures which make the cause much less liable to appear, or, if the measures adopted are sufficiently thorough, the cause may be prevented from putting in an appearance. Gapes is caused by the small red worms and their progeny.

**Treatment**—The most satisfactory treatment is prevention of contagion, combined with extraction of the worms from the infected chicks. All sick birds should be removed to quarters apart from the well ones. All coops and runs where infected birds have been should be thoroughly disinfected. The coops should have a thorough application of hot whitewash. The ground of runs should be well lined with air-slacked lime, spaded up, and should be sprinkled with one of the following solutions: A two per cent solution of sulphuric acid in water or two ounces of copperas (sulphate of iron) dissolved in a bucket of water; or a solution of permanganate of potassium in water, half an ounce of the crystals in a barrel of water; or a strong solution of creolin, two tablespoonfuls in each gallon of water.

The ground should be well sprinkled with one of the above solutions after infected chicks have been removed; then plow or spade and sprinkle again. Repeat this disinfection whenever infected chicks have been running on the ground. Scald all drinking vessels used by sick birds and be sure that the water used is boiling. If there are many earthworms and slugs in ground which has been occupied by chicks with gapes, get rid of the worms with one of the patented worm exterminators sold by nearly all seed men. Always burn all chicks which die of the gapes, and whenever you find gape-worms, or extract them from sick chicks, be sure to burn the worms. Disinfect all droppings. Earthworms do not cause gapes, but may become contaminated with the eggs or embryonic gapeworms, and so become a source of infection in ground where the disease has existed.

A small piece of copperas placed in the drinking water is said to prevent contagion. Tincture of asafoetida, a teaspoonful in a quart of water, is used for the same purpose, and is said to have a curative action. Three drachms of salicylate of soda in a quart of drinking water is also recommended as a preventive.

**How to Remove the Worms**—Extracting the worms from the windpipe is absolutely necessary to effect a cure. The operation is simple and only requires patience and a delicate touch. A loop of horsehair, stripped feather tip or one of the wire gapeworm extractors is the only instrument needed. Prepare a solution of one teaspoonful of creolin in a pint of cold water. Dip the extractor in this, both before and after using. The operator should sit in a comfortable position in a strong light with all things convenient for the operation, the affected chicks in a coop by his side and an empty coop to receive the treated chicks near at hand.

Hold the chick firmly in the left hand with its neck well stretched and head firmly between the thumb and forefinger. The mouth should be open and the neck held straight out from the body.

With the chick held firmly and the neck well stretched, dip the extractor in the creolin solution, shake off any excess of fluid, insert the extractor gently into the windpipe, and withdraw it with a slightly twisting motion. This will bring out most of the worms, and any which remain will be killed by contact with the creolin solution. Be gentle and keep your hand steady. You may strangle a chick or two at first, but with a little patience you will acquire skill and be able to treat the chickens easily and rapidly.

If you move your chickens to fresh ground or cultivate the ground year after year and keep oats, rye or some crop growing in the yards you will seldom, if ever, be troubled with this diseose. Do not let the chicks out in the morning until the sun is well up and the earthworms have been driven into the ground, if you are troubled with gapes.

## RHEUMATISM

**Symptoms**—It is much the same as in the human family. It is caused by exposure to dampness or cold, and may be caused by poorly constructed and ventilated houses, improper care, feed, etc. The bird seems stiff in the joints, walks lame and lacks energy and activity.

**Treatment**—Such birds should be kept in a dry, warm, well ventilated place, and given a good ration with plenty of green food. Sometimes it is a good idea to rub the joints, legs and shanks with tincture of arnica.

## LEG WEAKNESS

**Treatment**—Pearl, Surface and Curtis, in Poultry Diseases and Their Treatment, have this to say regarding leg weakness: "The term 'leg weakness' is sometimes used by poultrymen to indicate the lameness due to rheumatism in adult birds. The more usual use of the term 'leg weakness' is to denote a disease or ailment which is found in growing chicks from one month to six months of age. It is said to be more

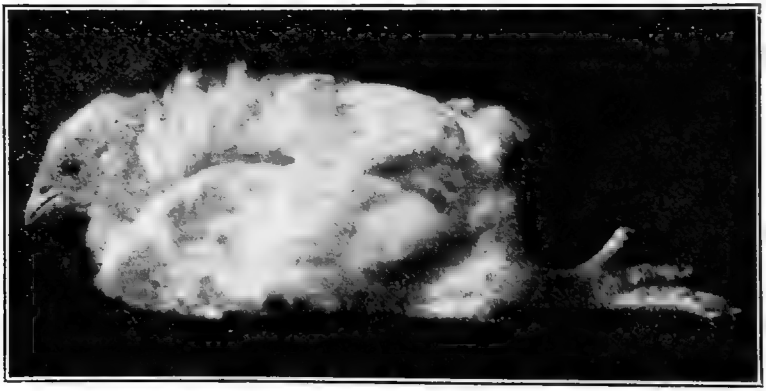


Fig. 67. A young chick affected with leg weakness. It is apparently healthy but staggers and falls as it attempts to move. Because of weakness in the legs it falls and often rests with one or both legs extended as in this case.

common among cockerels than pullets and is more freqnuent in the heavier than the light breeds. The chief cause of the trouble seems to be that in birds growing rapidly and fed heavily the weight sometimes increases faster than the strength. This results in a weak kneed, wobbling bird. The disease is sometimes ascribed to other causes, such as overcrowding, close, unventilated quarters, overheating, etc. Salmon says: 'It may develop in young chickens kept in brooders in which the heat is not properly distributed or where there is too much bottom heat, also in those which are kept constantly upon wooden floors.' Regarding these cases Robinson says: 'Where such conditions are present the leg weakness is more likely to be an accompaniment of diseases which plainly show other symptoms.'

"The symptoms are indicated in the name of the disease. It first appears as an unsteadiness in the walk. This may gradually become worse until the bird is unable to stand alone and is constantly tumbling over. The birds are found sitting while eating and are inclined to walk very little. When the trouble first appears there is little else wrong with the bird. The eye and comb are bright and healthy, the appetite is good. Later, however, the bird being weaker than the others, gets less grain, and becomes thin, feathers out poorly and is a distressed object. It is said that rheumatism can be distinguished from leg weakness by the swelling of the joints in the former disease.

**Treatment**—This consists chiefly, of course, in removing the cause. Since the most common cause is the overfeeding with fat producing foods, the amount of these should be reduced. The weak birds should be removed to a pen by themselves. Substitute bran, wheat and oatmeal for the corn and corn meal. Give skimmed milk, if possible, instead of water. **Feed plenty of green food.** This is one of the most important measures. Sanborn recommends rubbing the legs with tincture of arnica and adding one-half teaspoonful of tincture of nux vomica to each quart of drinking water."

## LEG WEAKNESS IN CHICKS

When early hatched chicks that have been making a rapid growth suddenly lose the use of their legs without losing their appetites or showing any other signs of disease, the trouble is due to leg weakness. Leg weakness is particularly troublesome with brooder chicks although it may attack chicks brooded with hens where they are closely confined. The causes of leg weakness have been a matter of much speculation among poultry keepers for a good many years and it is only within the last few months that a really satisfactory explanation of the cause of this trouble has been advanced. Poultrymen have advanced the theory that leg weakness came from feeding a ration too rich in fattening material which caused the bodies of the chicks to develop faster than their muscles. Others have suggested that lack of exercise was the primary cause. Still another theory has been that too high a temperature and dirty quarters were chiefly responsible. Although the cause of the trouble was not known, the remedy has been the common knowledge of poultrymen for a long while and consists simply in getting the chicks out on the ground. Recent experiments at the University of Wisconsin have indicated that the primary cause of leg weakness is digestive disturbance brought on primarily by the poor elimination of waste from the bodies of the chicks. Reports from this station indicate that the principal cause of leg weakness appears to be a lack of inert material in the ration which will cause the quick cleansing of the digestive tract through mechanical stimulation. Feeding of oil and other purgatives did not prevent nor cure the trouble, but feeding a ration that was high in indigestible inert material was effective in preventing the development of the trouble and also valuable in relieving the difficulty after it had developed. The investigators found that including such indigestible material as paper in the ration for the growing chicks would prevent leg weakness. They also showed that fresh earth mixed with the feed or placed in the houses where the chicks could have access to it was eaten in relatively large quantities, and where fresh earth was available leg weakness did not develop. These researches add nothing to the practical knowledge of the best remedy for leg weakness but they do show why it is important that the chicks have access to fresh earth if this difficulty is to be prevented. Whenever the weather is favorable baby chicks should be allowed to get out on the ground and to have as much free range as is consistent with good brooding practice. If the weather will not permit of the chicks being outside, then the poultry keeper ought to see that fresh earth is brought into the house and made available for the chicks every day. A practical way of supplying fresh soil in the house is to dig up large pieces of heavy blue grass sod and place these in the brooder house with the root side up for the first day. After the chicks have eaten what soil they want and have picked out the roots, the sod can be turned over and give the chicks a chance to pick off the green sod so that they will have the double benefit of securing green food and inert soil material from the same piece of sod. Where leg weakness has already developed the treatment should consist in cutting down to a certain extent the amount of grain and mash which the birds are being fed and getting them out onto the fresh earth where they will take more exercise and at the same time will be able to eat the inert material which is needed.

One of the best remedies and preventives of leg weakness in chicks that we have ever tried is to add five pounds of fine bone meal to each 100 pounds of mash and give an abundance of tender green feed.

## THE ESSENTIALS IN CHICK RAISING

The essentials in chick raising are to keep them comfortable and well fed. They must be free from lice and mites. There must be cleanliness; cool and inviting shade; generous range and plenty of room in their roosting quarters; and the chicks must not be allowed to suffer from hunger or for the lack of drinking water.

A noted poultry authority gives ten rules to follow in raising chicks. The advice is practically the same as that which we have recommended and is as follows:

1. Provide fine grit, charcoal, shell and bone from the start.
2. Give grass .range or plenty of green food.
3. Have fresh, clean water always available.
4. Feed only sweet, wholesome food.
5. Avoid damp and soiled litter.
6. Disinfect brooders frequently.
7. Test all beef scrap before feeding.
8. Keep chickens active by allowing them to become hungry once daily.
9. Keep dry mash always before the chicks.
10. Feed sour skimmed milk or buttermilk in well cleaned pans.

If you hatch 50 to 75 per cent of the eggs set and you are successful in raising from 50 to 75 per cent of the chickens hatched you are doing as well or better than the average. We are now speaking of large flocks. We have seen houses equipped with the very best brooding devices that money could buy, and yet the poultryman was only able to raise about 50 per cent of his chicks.

The first ten days to two weeks of the chick's life is the most critical period, and if you can pull it through for the first few weeks you have your battle half won.

There is no prettier sight than to see a brood of nice fluffy baby chicks, but too often the scene is changed in a few days and the hopes of the owner are blighted and the little chicks grow sick and weak, and death finally results.

When the little babies are hatched the poultryman is very enthusiastic, but after the novelty of their cuteness has worn off, the poultryman too often finds that the endless duties required have become monotonous, and for this reason the flock, which was well started often suffers later in life because of neglect.

## THE INTERNATIONAL BABY CHICK ASSOCIATION

Organized in 1913 through the interest and activity of a few commercial hatcherymen, the International Baby Chick Association has grown to be one of the largest and most influential organizations of poultry producers in the United States. Its membership in 1921 had risen to over two hundred. All of the active members are actual owners and operators of hatcheries and breeding plants. The combined incubator capacity of the members of the Association is estimated at about twenty million and they turn out each season approximately one hundred million baby chicks. One hatchery alone has a capacity at one setting of one million eggs and there are a considerable number with a capacity of five hundred thousand. The objects of the International Baby Chick Association are: To foster, promote, improve and protect the baby chick industry and all allied branches of poultry husbandry. Through the influence and efforts of the International Baby Chick Association, many changes have come about in the handling of all chicks which have made possible the present wonderful development of the baby Chick Industry. Among these is the development of standardized boxes and methods of packing and shipping. Probably the most notable development accomplished through the efforts of this organization is the shipping of baby chicks by parcel post which has greatly improved and facilitated the shipping conditions to which the chicks are subjected.

During 1920 and 1921 this Association organized an intensive Publicity Campaign, the object of which was to acquaint the public with the true food value of poultry and eggs and their right place in the human diet. The results of this campaign were far reaching in their influence; the object being to stimulate a greater interest and a greater development of American Poultry Husbandry. Everyone who is actually concerned with the production of baby chicks commercially should be affiliated with the International Baby chick Association.

## THE BABY CHICK

### Lesson No. 15

1. Name three things which are often responsible for death in the shell.

2. What are some of the most common mistakes made in feeding baby chicks; and what is the reason for not feeding too soon after hatching?

3. Give what you consider a good ration with which to start baby chicks.

4. Is it advisable to change abruptly from one feed to another? Why?

5. Why is moistened mash desirable; and what are the advantages of free range and fresh ground.

6. If you had quite a number of colony houses on free range, what method should be used to get water and feed to the chickens?

7. Mention some of the causes of disease in young chicks.

8. Discuss best methods of prevention of white diarrhea in young chicks.

9. Give the precautions necessary to prevent gapes in young chicks.

10. How would you prevent and cure leg weakness?

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# Natural and Artificial Incubation

By T. E. QUISENBERRY

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## EARLY HISTORY OF INCUBATION

THE inventive American has been a great factor in the development of artificial incubation, but the origin of the idea belongs to the ancient Egyptian or the Chinese. The matter is in dispute, as the methods are similar. The Egyptians use large ovens which have a capacity of several thousand eggs. They are located in villages and are operated for the whole community. The eggs are sometimes bought outright and the baby chicks sold, or they, in some cases, buy baby chicks and sell their eggs. We think of the big mammoth and community hatchery as something entirely new. With us it is, but not so with Egypt and China.

The methods seem crude to us, but they have been successful. The trade is handed down from father to son and is a matter of heredity and long training. The sense of touch with them has been largely developed, and they do not depend upon the thermometer. The egg is pressed into the eye socket in order to ascertain whether the heat is right. Some one is always on duty, as they do not have the sensitive thermostat to gauge the heat. They have no thermometers, no hygrometers, no thermostats for the automatic regulation of temperature. Success or failure depends solely upon the skill of the operator.

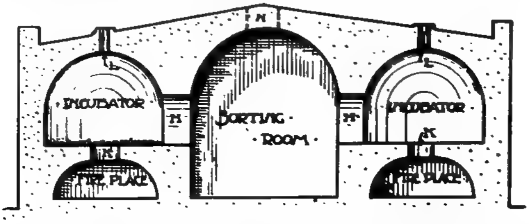
The Egyptians have buildings about 70 by 100 feet, made of sun-dried brick. In the end are two or three halls that guard the temperature from the effect of opening the doors. There is a central passageway leading from one of these doors up the center of the building. There are small entrances to double story circular vaults. Around this vault runs a low wall about six inches high. In this is placed the fuel, composed of dried dung and straw, or slowly burning charcoal. The operator's place is in the center of the vault, where he can change the position of the eggs and keep up with their condition. The eggs are laid on mats that are covered with bran. There are small holes in the top of the vault that permit the escape of smoke and surplus heat. They test the eggs as we do on the sixth or seventh day.

With these people it is a restricted profession. How different here in America, when the range of choice of incubators is so great that it is almost impossible to decide the kind to buy.

We cannot undertake to say which is the best machine, because opinions, climates and conditions differ so widely. We think that there are standard machines just as there are standard cream separators or any other kind of farm machinery. It is possible to fail with any kind of a machine, and it is likewise possible to hatch chickens with any machine that is placed on the market. The fact that a machine hatches chickens is no reason to believe that it is a good machine.

The earliest attempts at artificial incubation that have led to the making of the modern incubator were made in France under Francis I., who became interested in the subject in 1540. In 1777, Dr. Bonnemain constructed what was called an Eccalobian, which was used successfully, and chickens were placed on the Paris markets that were artificially hatched and reared. In 1845 M. Vallee, a superintendent of a poultry plant near Paris, made a machine with an automatic valve which aided in the temperature control. This really marked the beginning of the era of improvement, during which the modern incubator was evolved.

In America, in 1870, Jacob Graves & Co., of Boston, patented an incubator that was popular for a long period. It had a hot water tank above the eggs and a cold water tank under them. Above all this was the chick nursery box. The regulator was controlled by the expansion of alcohol in two large tubes extending through the egg chamber. A Mr. Halsted constructed flues which extended through the tank. This made the temperature hotter in the center than on the edges. The regulator used by him was mercury expanded by heat, which overbalanced a lever. He later abandoned this for a thermostatic bar. This is the principle that is used on the modern machine.



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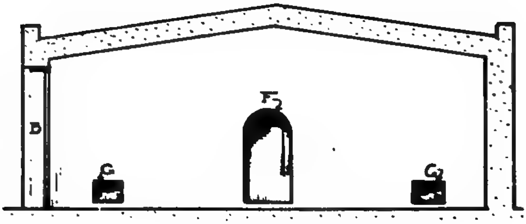

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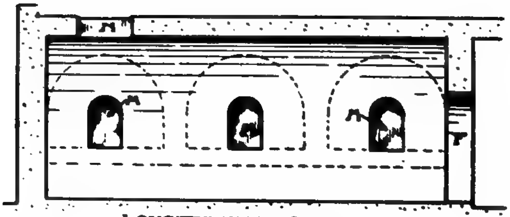

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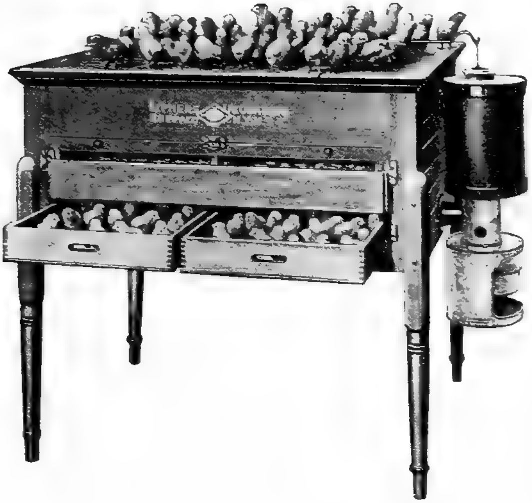
An Ancient incubator. For thousands of years the Egyptians and Chinese have hatched eggs in incubators similar to this.

While there have been many improvements in incubators in the past ten years, their general type has not changed materially. We have the hot water and the hot air machines; the radiating and diffusive systems; the top, side, bottom and contact heat. Then there are the methods of ventilation—by direct openings, by ventilating shafts, open bottoms, porous or curtain sides, and some suck the foul air out of the egg chamber into the heater. The most radical change in ventilation is the double bottom machine. These are what are styled "moisture machines."

## GOOD BREEDING STOCK THE FOUNDATION OF SUCCESSFUL INCUBATION

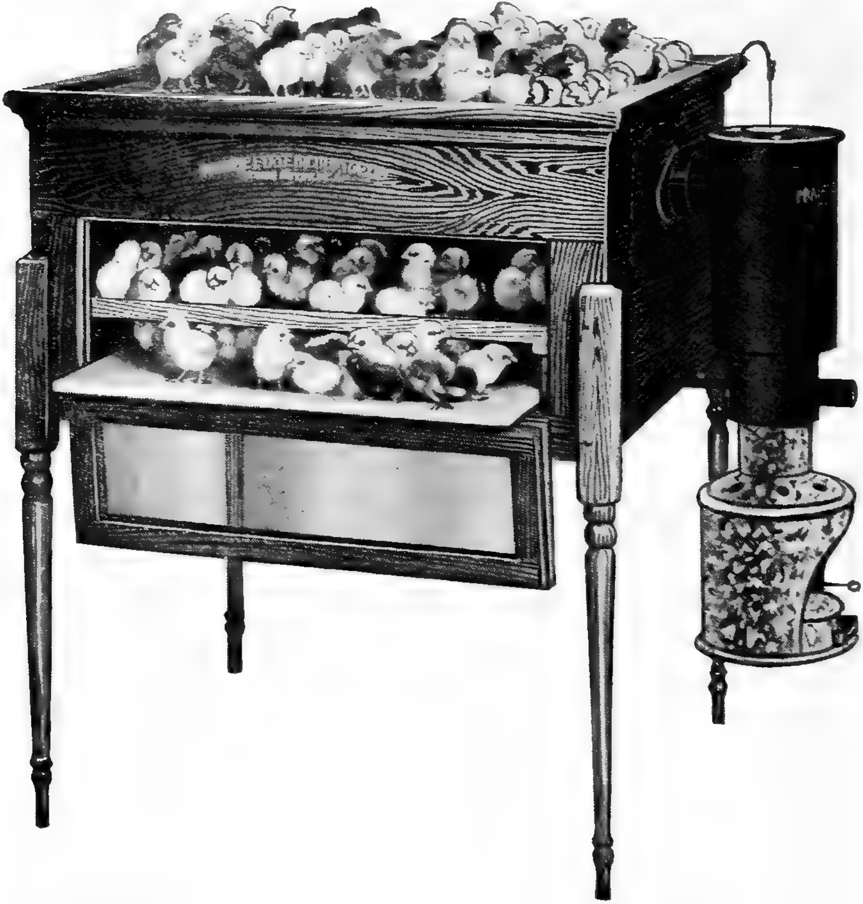
Probably the hardest problem that the poultryman must face is that of incubation and brooding. It is a step away from Nature when eggs are placed in an incubator and an effort made to hatch with heat from a lamp or stove. Many are the failures that are recorded because the chicks are not hatched properly. The old hen that steals her nest in some out-of-the-way place and hatches her little brood can raise them regardless of the season of the year; it is the natural method. So we must find an incubator that will turn out as lusty chicks as these; then we will have paved the way to success. The first requisite to successful hatching is that the parent stock must have constitutional vigor. The kind of hen that we have just mentioned has had the run of the range. She has had plenty of exercise and fed after the fashion that Nature intended she should be fed. She has picked her grain here and there and balanced the ration with the bugs and worms that she chases over the fields. She has not been overfed and has not had her vitality impaired by overfeeding on feed too rich in protein. This fine vitality is transmitted to the growing embryo, and, as she gives out the necessary heat without violent fluctuations in temperature, healthy chicks crack their shells and come forth as clean from the shell as does a ripe raspberry when plucked. This mother hen has the advantage in the character of eggs that she incubates. In contrast to this, many eggs that are placed in machines come from hens that have been forced for egg production, that have lived under close confinement, and that have known nothing of scratching their own way. Eggs from this type run low in fertility and have weak germs that either die in the shell or, if they reach the daylight, are so weak that it is almost impossible to rear them.



A Hot Air Machine made by the Cyphers Incubator Co. Shows the nursery drawers below the egg trays into which the chicks drop at hatching time. These drawers can be opened and the chicks removed at any time during the hatch without disturbing the eggs above and without causing the temperature to be lowered.

Poor hatches, though, cannot always be blamed on the parent stock. The Oregon Station gives the information that one method of hatching gave 78.8 chicks from a hundred eggs set, while another method gave 60.6.

When brooded in artificial brooders, 90 per cent of the chicks were reared, while 67 per cent of the others were alive at the end of four weeks. When brooded under hens, 98 per cent of those hatched by the first method were alive at the end of four weeks, and only 50 per cent of the others. Poor methods of brooding are often responsible for losses. In this case, when eggs were used with both lots, it is good proof that the chicks hatched by the first method were hatched well, while the latter showed that the incubation was at fault.



A Prairie State Hot Air Incubator. This shows the door open and the chicks in the nursery below the egg trays. The moisture sand trays in this machine go below where the lower chickens are seen. The sand tray remains here until hatching time, then it is removed.

## THE FOUNDATION ON WHICH TO BUILD

When the chicks are ready to be placed in the brooder, the fight has just begun. They can look fluffy and fine, but if the stock back of them has been poorly fed, poorly housed, or lacking in stamina, it matters not how well they have been hatched, the chances are against them. The breeding-pen is the foundation on which to build future success with the young stock. Or if there has been irregularity in the heat, especially during the first week of the hatch, there is little hope. A fairly good percentage may hatch, yet they have not the vitality to keep them living. Perfect brooding will not save them.

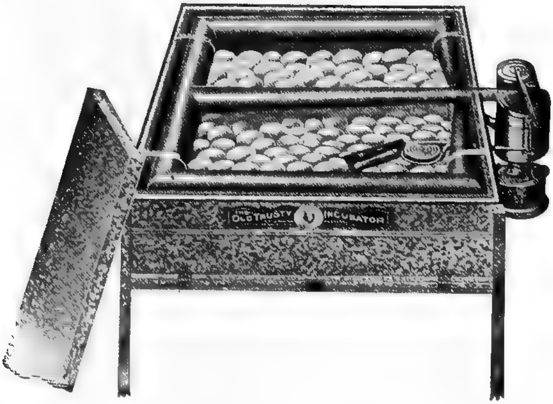
To have success with incubator chicks, they must be well born. It is necessary, when you are looking for the cause of your trouble, not to seek causes which might be immediate, but go back with the life history of the egg. Then take the life history of the sire and dam. We lay stress on this for so many write of poor success with incubator chicks and cite only the conditions that immediately surround the chicks. When you have trouble and wish aid in solving the difficulty, give a complete history of how the stock has been handled and of the variation of the thermometer during the hatch. Also, the moisture and ventilation should be noted.

In this lesson we are trying to anticipate every difficulty which, if the operator were ignorant of it, would cause failure. In many cases you will be able to detect the cause of your trouble better than one who does not know the conditions.

## WEAK STOCK

Hens store up a certain amount of mineral matter, carbohydrates, and protein in their bodies. If they lay excessively during the winter season, they will draw on much of this before the end of the laying season. At the height of their laying season they will be in the best flesh of the period. Toward the close of the laying period they draw on the mineral matter in their bones to meet the needs of egg production. The coloring matter is then taken from their legs to help color the eggs. This is one reason that the eggs from high laying hens often turn out weakly chicks. Their system has had a severe drain; they are lowered in vitality, and naturally, the chicks would inherit this weakness.

Sometimes it is difficult and seemingly expensive to keep hens through the entire laying season without using any of their eggs for hatching purposes. However, if you expect to continue to rear strong, vigorous stock and reduce the death losses, we think this is the method to pursue.



The outside covering of this magazine is galvanized iron. This shows the hot water pipes, the lamp and heater, the egg trays and the thermometer, the top having been removed. This is an Old Trusty Incubator.

Again, it is a fault to crowd the male bird and place too many hens with him. It is also possible to have too few, which will cause him to injure the hens, and thus injure the hatching power of the eggs.

## FEEDING AFFECTS INCUBATION

Feeding foods that are excessively rich in protein for forcing eggs will injure the hatching qualities of the eggs and lower the vitality of the chick.

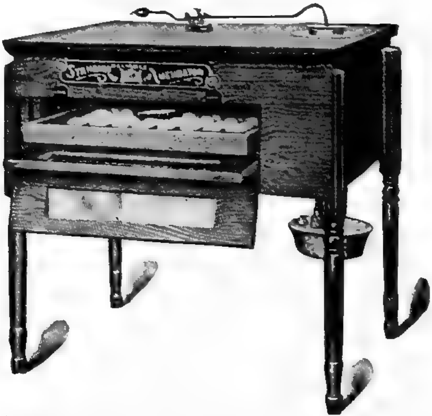
Feeding condiments or very rich food to force egg production or feeding too fattening foods causes an over stimulation of the egg organs, which may cause degeneration and a lessening of the breeding power. Feed whole grains, give plenty of green food, compel birds to take lots of exercise, give free range at all seasons, and avoid mashes and meat scraps and dry beef scraps, except just during the breeding season.

## NATURAL OR ARTIFICIAL METHODS

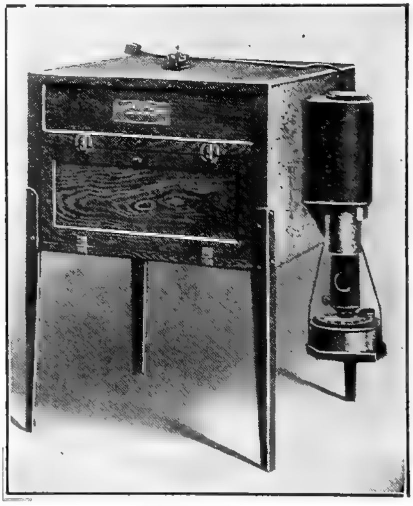
If you do not intend to rear more than one hundred or one hundred and fifty chickens a year, it will probably pay you to stick to the natural method. If you want chickens hatched out of the season when hens normally sit, then you must depend on the machine. You can seldom get broody hens during the winter and very early in the season.

## ADVANTAGES OF THE INCUBATOR

"Shall I use incubators or hens?" is a question which thousands ask themselves every year, and every year sees a larger proportion of them deciding in favor of the incubator. During the past ten years, incubators have been improved and perfected until they are universally acknowledged to be worthy rivals of the old hen herself.



An Incubator made by the Reliable Incubator Co. This shows the thermometer, the egg trays, and the removable nursery tray underneath the egg chamber.

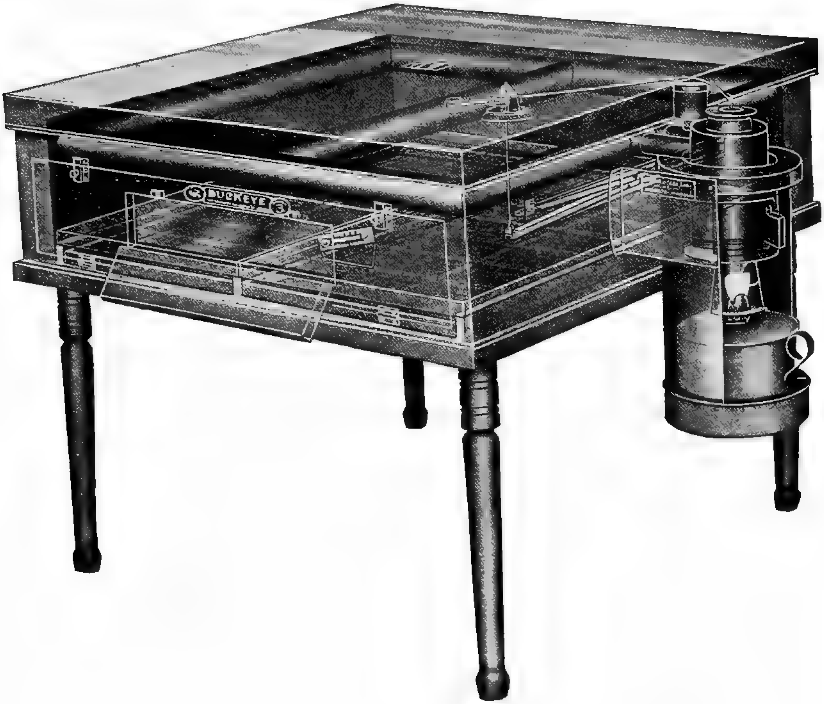


A Buffalo Incubator. The front of this machine is finished in ash and the outside covering of the remainder is galvanized. Some write to know whether we prefer wood or metal covering for an incubator. We see no preference, if there is plenty of insulation on the interior. That is what means most to the walls of an incubator, and not the outside covering.

Where one only raises seventy-five or a hundred chicks a year, and is not particularly anxious about hatching them early, and has a variety of poultry, the hens of which are good sitters, an incubator will probably not be considered a necessity. However, the number of people whom the above description fits is growing smaller every year. There is so much money in early hatched broilers, capons, and winter eggs that the average person will not be satisfied to leave his hatching operations to biddy's whim.

The early hatched cockerel brings twice as much per pound on the market as does a late hatched cockerel of the same age and weight. Early hatched pullets make the best winter layers. By the use of the incubator, the length of the hatching season can be doubled and profits also increased.

A great many people imagine that an incubator is a very delicate and complex machine, requiring the services of an expert in order to be successfully used, and that you are required to sit up at night to watch the temperature. Such an idea is entirely foreign to the facts in the case. The modern incubator will almost run itself. Any one of average intelligence, who will carefully follow the directions which go with each machine, and who will use a little common sense, can successfully operate an incubator.



This phantom photograph shows the entire construction of a Buckeye Standard Incubator with each part in its correct position. This is a hot water machine.

We give a comparison made by Prof. Dryden, of Oregon, as to the difference in the cost between an equipment for hatching artificially and one for handling the hatching and brooding work Nature's way.

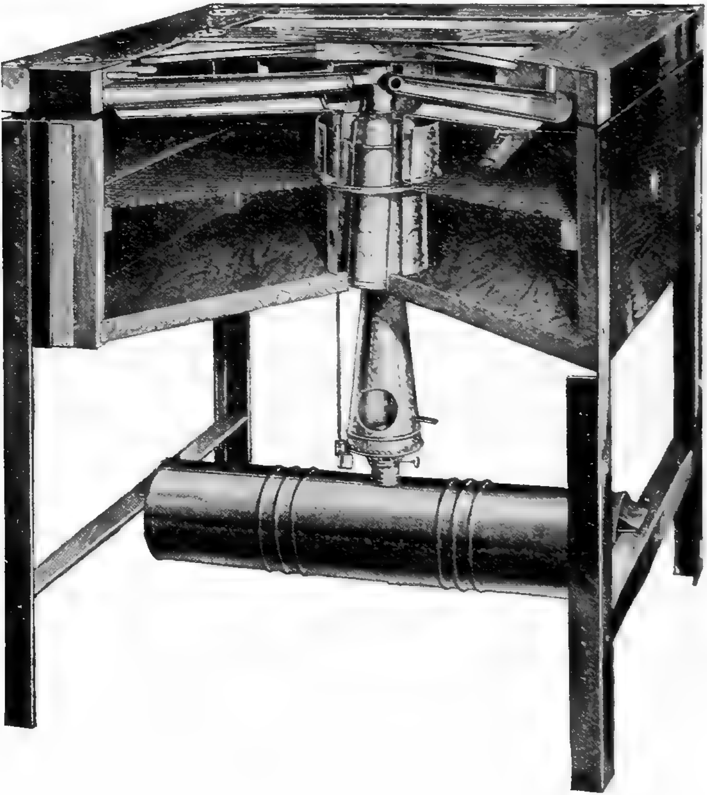
| | |
|---|---|
| 1 incubator, 150-egg capacity | $20.00 |
| 2 brooders for 100 chicks | 20.00 |
| 2 colony houses | 20.00 |
| Coal oil for incubator, 5 gallons | 1.50 |
| Coal oil for brooders | 2.10 |
| | $63.60 |

In considering the difference in cost, you must bear in mind that here you have two colony houses that can be used throughout the season.

By the natural method the cost will be about as follows:

| | |
|---|---|
| 3 combination hatching, brooding, and colony coops | $24.00 |
| Feed for sitting hens | 1.00 |
| | $25.00 |

He states that a good incubator with good eggs and good management will produce 100 chicks from 150 eggs. To rear them artificially, they must be divided into lots of 50 to 75. By the natural method, the cost of hens is not included, as they are in no way injured for future work. The brooding period is her rest time, and it is doubtful if she is any the worse off by having carried a brood of chicks.



A sectional view of the X-Ray Incubator, showing the construction of same.

## SUMMARY OF PROF. DRYDEN'S TESTS AND EXPERIMENTS

1. "From 879 eggs set, incubators hatched 533 chicks, or 60.6 per cent.
2. "From 279 eggs set, hens hatched 219 chicks, or 78.8 per cent.
3. Eliminating eggs broken in nests, the hen hatched 88.2 per cent of eggs set.
4. "The incubators hatched 78.5 per cent of 'fertile' eggs, and the hens hatched 96.5 per cent.
5. "Eggs incubated artificially tested 22.7 per cent as infertile, while those incubated by hens tested out 11.8 per cent.

6. "The incubators showed 16.6 per cent of chicks 'dead in the shell,' and the hens, 2.8 per cent.

7. "Chicks hatched under hens weighed heavier than chicks hatched in incubators.

8. "The mortality of hen hatched chicks brooded in brooders was 10.8 per cent in four weeks, and of incubator hatched chicks, 33.1 per cent.

9. "The mortality of hen hatched chicks brooded under hens was 2.2 per cent, and of incubator chicks, 49.2 per cent.

10. "In other tests, the mortality was 46.5 per cent for incubator chicks brooded by hens, and 58.4 brooded in brooders.

A Petaluma Electric Incubator. Can be used for direct or alternating current of 110 volts. There is nothing nicer, cleaner, or easier to operate than an electric incubator. The only question is the price of your current. Unless this is very cheap, it costs too much to heat your machine. This shows the electric connection, the egg trays, and the wire chick baskets in the nursery below.

11. "Hen hatched chicks made greater gain in weight than incubator chicks, whether brooded by hens or brooders."

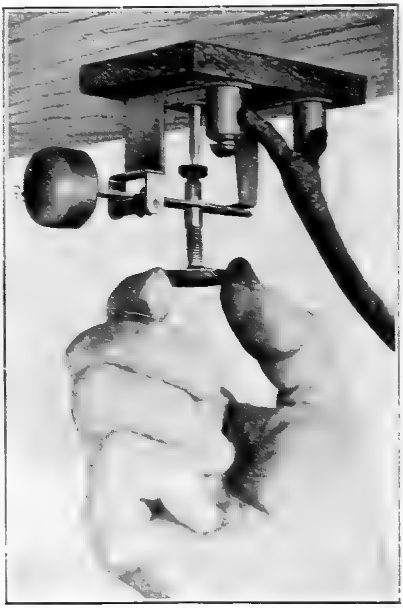
This record ran right on through the summer. If the comparison had been made with incubators run during the months of January, February, and March with the hen hatched chicks in April, May, June, and July we believe that more chicks could be reared by the artificial method. It is a well known fact that incubator hatched chicks do far better during the winter months. It is difficult to hatch and rear chicks artificially during the warm weather. If you expect to raise chickens in large numbers, it is necessary to hatch and raise them by artificial means. You can also hatch your pullets earlier by using incubators. Some seasons hens do not become broody until late in the spring.. The early hatched stock is usually best.

By using incubators, you can keep your best winter producers and best layers busy producing eggs from which to do your hatching. The first hens to go broody in the spring are your very best layers and your winter layers, from which you should breed. If you use those for hatching purposes, you are likely to be setting eggs from the layers that waited until the warm days of spring to begin to lay.

In investigating the effects of the method of incubation upon the egg-laying ability of hens in the National Egg-laying Contest at the Missouri State Poultry Experiment Station, the following facts resulted:

## HATCHING WITH HENS OR INCUBATORS

"The question is often asked: 'What influence has hatching with incubators on egg production?' In order to get some idea from the records in the Missouri Experiment Station National Egg-laying Contest, three divisions were made: First, where the pullets were hatched under hens; second, where they were hatched in incubators; and third, where part were hatched one way and part the other, or hatched in an incubator and raised with hens.



The Circuit Breaker on the Petaluma Electric Incubator. The regulator expands or contracts, turning on or off the electric current. This regulator is very simple and accurate and is on the underneath side of the incubator.

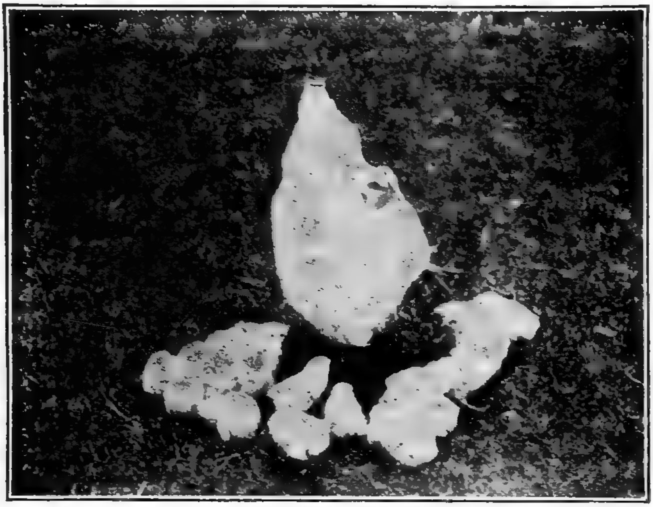
"The pullets which were hatched under hens averaged 155 eggs per hen during the year; the ones hatched in incubators averaged 163 eggs each; while those hatched part one way and part the other, or hatched in an incubator and raised with hens, averaged 149 eggs each .

"As to the reason for this difference we can only theorize, but my idea is that there is absolutely no difference, provided the chick comes out strong and healthy; but we think the difference lies in the number of birds the owner had from which to make his selection. Those who hatched with hens had flocks which averaged 102 hens; those who hatched with incubators had flocks which averaged 387 hens; while those who hatched both ways had flocks which averaged only 70 hens.

"Another reason is that where incubators are used, more attention is paid to the selection and breeding. Then, too, the chicks are hatched earlier, so that the eggs are selected from good layers; while those hatched with hens are often eggs from poor layers placed under the good laying hens; for the winter layer often goes broody about the time the poor layer begins laying in the spring."

## NATURAL INCUBATION—HATCHING WITH HENS

SHALL I HATCH CHICKS WITH HENS? This is a question which every person must answer for himself, and the answer depends largely upon conditions and circumstances. Where only comparatively few chickens are to be raised during the season, or where it is immaterial when they are hatched, or if one is so employed as not to have time to care for an incubator, it will, of course, be best to use hens for hatching purposes.



The natural method of incubation is all right if you contemplate raising only a few chickens. If you raise many, invest in an incubator.

The most common reasons advanced for the use of hens for hatching purposes are:

1. That hens are more economical where only a few chicks are to be hatched. This is true, provided the first cost, only, is taken into consideration.

2. That a larger percentage of fertile eggs incubated under hens will hatch, and that the chicks will show a greater amount of constitutional vigor. This is no doubt true where the results obtained from hens are compared with the results obtained from cheap incubators, poorly managed by unskilled operators.

The main disadvantages of using hens for hatching purposes are:

1. That we can not make our hens sit at will, neither can we persuade several of them to become broody at the same time. The demand for early hatched chicks, both for fancy and utility purposes, becomes stronger every year, and best results are secured by having the young stock as near the same age as possible.

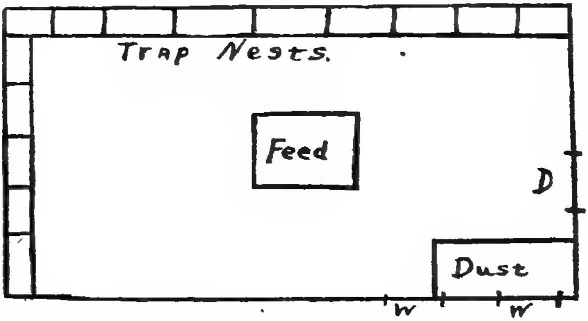
2. That hens are often whimsical, nervous and unreliable. Eggs are broken in the nest, they stay off the nest too long at a time, and sometimes decide not to go back at all.

3. That hen-hatched chicks are much more liable to become infested with lice and mites than are incubator hatched chicks.

## SELECTING THE SITTING HEN

Just because a hen becomes broody does not necessarily mean we should use her for hatching purposes. It depends both upon the individual and the variety. The smaller egg-laying varieties, such as the Leghorns, Anconas, Hamburgs, etc., are notorious for their fickleness. They may think they want to sit today, but change their minds tomorrow. It is rarely advisable to use these varieties for hatching purposes. If they are broken up when they show the first signs of broodiness, they will soon go back to laying again. Hens of the general purpose varieties, such as the Plymouth Rocks, Wyandottes, Rhode Island Reds, Orpingtons, etc., as a rule, make the best mothers. Hens of the heavy Asiatic varieties, such as the Brahmas and Cochins, are inclined to be both too heavy and awkward to make the best mothers. They break the eggs in the nest and often crush the chicks after they are hatched.

None but hens that are in strong, vigorous, healthy condition should be allowed to sit. The hen that has a weak constitution, and which is not perfectly healthy, is liable not to have the proper body temperature to bring off a successful hatch, and is not apt to be able to stand the strain incidental to the hatching and rearing of a brood.



Outline of a House for Sitting Hens.

If you use many sitting hens, you should arrange their nests in a separate house, away from the laying hens and breeding stock.

## LOCATING THE SITTING HEN

Hens should never be allowed to sit where they will be interfered with by the other members of the flock. To do so is to invite disaster. After having been allowed to sit for twenty-four hours, the hen should be removed to a quiet place entirely away from the balance of the flock. This moving should be done at night, especially if the hen is of a nervous disposition. It is well also to shut her on the nest during the following day.

Where the sitting hen should be placed depends somewhat upon circumstances, as well as upon the season of the year. She should be protected from the weather and her quarters should be rat and vermin proof. She should be warm in cold weather and cool in warm weather. It should be quiet, and the light should be subdued. In winter or early spring, also in hot summer weather, a dry, well ventilated cellar or cave fulfills these conditions nicely. However, as soon as the weather becomes mild in the spring, one of the most successful methods of handling a sitting hen is to place her in a small outdoor nesting coop, making the nest right on the ground. Repeated experiments have shown that where hens are set in this way larger hatches and stronger, more vigorous chicks are secured. (See illustration of combined hatching and brood coop.)

## THE NEST

The nest in which the hen is placed is a very important adjunct to the bringing off of a successful hatch. If it is not convenient to build it outdoors, or a shed having a dirt floor is not available and you are forced to use nests with wooden bottoms, it is a good plan to cut a square of fresh sod the size of the nest and lay it in the nest, top side down, then hollow out the sod so that the eggs will lie in it nicely, putting in sufficient straw to keep them clean. Nests for sitting hens should be not less than 14 inches square, inside measurement, and 16 inches is still better. Do not make a nest into which the hens must jump down from above, as it is almost certain to result in breaking the eggs. Make the nest so she can walk into it from the side.

### HOW THE NESTS ARE MADE

Nest-boxes, such as shown in the illustration, can be arranged around the walls of the house, and if necessary, they may be piled up like packing-cases, one on top of the other. This nest-box, which contains three nests, can be made from a 12-foot board, 12 inches wide. Cut the board into three lengths and use one length for the top of the nests, one for the botton, and one for the back. Take four pieces of similar board, 1 foot square, to make the ends and partitions. This provides for the three nests to a section. The front is hinged at the bottom and the cross pieces have shoulders that brace the door in a horizontal position when open. This open door forms an alighting board for the hens when the nests are placed one above another.

Ideal Coops for Natural Incubation. Each nest is about 14 inches square, and is made on the ground. Each compartment has a wire bottom to make it rat proof. Each hen has her individual run. Water and feed are provided in the trough in front.

The nest itself may be formed by putting a piece of sod in the bottom of the nest-box with grass or litter around the edges. Have the slope of the nest somewhat flat, rather than deep.

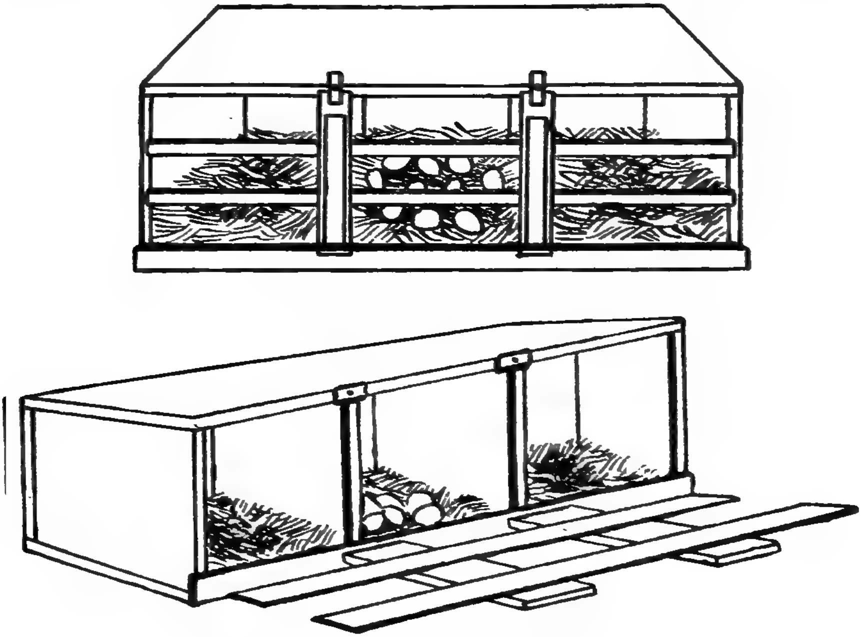
### SET SEVERAL HENS AT ONCE

It is a good plan to start several hens at the same time, so that, when the testing is done and the infertile eggs removed, the eggs that remain can be doubled up and given to fewer hens. Another doubling up should take place when the dead germs are discarded at the second test; and when the chicks hatch, they should be put with as few hens as will brood them, while the other hens are put back into the laying pen or set again.

In this system, the hens are under control and the work reduced to the minimum. It is necessary to go into the house once a day, when the doors to the nests are opened, all hens (except those under which the chicks are hatching) are taken off, and the doors closed. There is in the house plenty of feed and drink, so that all the sitters can get what they require. They can also get a dust bath, and in from ten minutes to half an hour the doors to the nest-boxes can be opened and the hens allowed to return to the nests.

## CARE OF THE SITTING HEN

Both for her own welfare and that of the coming brood, one of the most important features of the care of the sitting hen is to be absolutely certain that she is free from body lice and that her nest is free from mites. Many a hen has died on the nest as a result of being literally consumed by these pests, and many a brood has been ruined because lice and mites began preying upon them as soon as they were hatched. The sitting hen should be thoroughly dusted with some effective lice powder when she is placed upon the nest and a little of the powder should be sprinkled around the edges of the nest. She should be dusted again on the fifteenth day, and if the work is properly done, there should be no trouble with lice or mites. A constant lookout should be kept, however, for the first signs of these pests. Neither lard nor grease of any kind should ever be applied to the body of a hen while she is sitting; for if any appreciable amount of oil comes in contact with the eggs, it will be fatal to the developing chicks.



NESTS, CLOSED AND OPEN

This shows a very good method of building nests for sitting hens, where the hens are kept confined to a shed or building used for natural incubation.

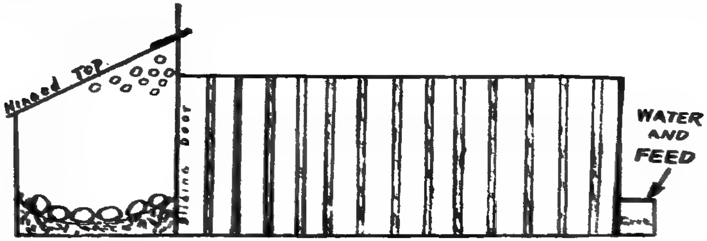
If a number of sitting hens are kept in the same room, it will be necessary to confine each hen upon her nest; otherwise you will be sure to find two hens on the same nest, and one nest with the eggs cold and the hatch spoiled. The hens should be let out each day to eat, drink and exercise, for about fifteen minutes. This time may be lengthened if the weather is mild. Any hens that are not inclined to go back upon the nest at the proper times will have to be caught with as little commotion as possible and quietly put back. It will be seen that a great saving of time and trouble will be made if the hens are placed in separate coops, each having her own run in front of it. In this way the hen goes on and off at her pleasure and no other hen can get on her nest. It is necessary that an abundance of fresh pure water is kept before her, as well as plenty of feed. The feed should consist of whole corn and wheat, together with plenty of sharp grit, and a little green feed. Not much green feed is needed, however. A dust bath should be provided for the sitting hen. It is Nature's way of combating insect pests, and the sitting hen seems to enjoy it greatly.

It is a good plan to keep a record of the time each hen was set and when she will hatch. The nests can be numbered or a memorandum kept in a book, or a slip of paper can be tacked on each nest, upon which this information is placed. Do not trust your memory with regard to when a hen is to hatch.

If an egg in the nest is accidentally broken, the soiled nest material should be removed as soon as it is discovered and the hen washed if much of the contents of the egg is clinging to her. The soiled eggs should be washed; otherwise the pores will become closed and the devloping chick will be smothered.

As a general rule, the less a sitting hen is disturbed the better. She usually knows her own business better than we do. However, the attendant must see to it that each hen comes off her nest every day, even though she has to be taken off.

When it can be conveniently arranged, and when it is desired to raise the largest number of chickens possible, it is a good idea to set three or more hens at the same time. After they have been sitting on the eggs for eight days, the eggs can be tested out, those which are infertile discarded, and the balance of them placed under two hens, when the third hen may be reset. When the two hens hatch the eggs which were originally placed under three hens, the chicks can be given to one hen, and the second hen reset. (For directions for testing, see this subject under "Artificial Incubation.")



A drawing showing a side view of the nests and runs illustrated on the preceding page, except that feed and water pans or troughs should be at the end and on the outside of the runway. This is practically what is known as a Natural Hen Incubator.

It is rarely necessary to give any thought to the moisture problem where hens are being used for hatching purposes. However, if the weather is dry, and the hens are not sitting on the ground, it is a good plan to sprinkle the nest lightly with luke warm water on the fifteenth day.

When the chicks begin to hatch, let the mother hen severely alone. She does not welcome outside interference. It is a good plan, however, in the evening of the first day that the chicks are hatched, to lift the hen up far enough to remove the empty shells. It is not necessary to take her clear off the nest in order to do this. The chicks should be twenty-hours old before the hen and chicks are removed to the brood coop.

## HOW TO SET A HEN

The success with your hatch depends largely upon the manner in which your hen is set. Imitate the conditions that exist when a hen steals her nest as near as you can. How to build the nest, the nest material, the care of the hens, and the care of the eggs during incubation is herewith described for your benefit by one who has been one of the country's most successful hatchers by the natural method.

## LOCATING THE SITTERS

You have noticed, no doubt, that usually a hen who steals her nest hunts up a quiet, dark, moist place, where no other hens can bother her. This is the first step you must take—to hunt up a nice, cool, moist place, where you can set the hens and they will be undisturbed. If you are bothered with rats, see that the nests are placed where the rats cannot disturb the eggs, as nothing will discourage a hen like rats. I have heard that rats sometimes steal all the eggs from under sitting hens.

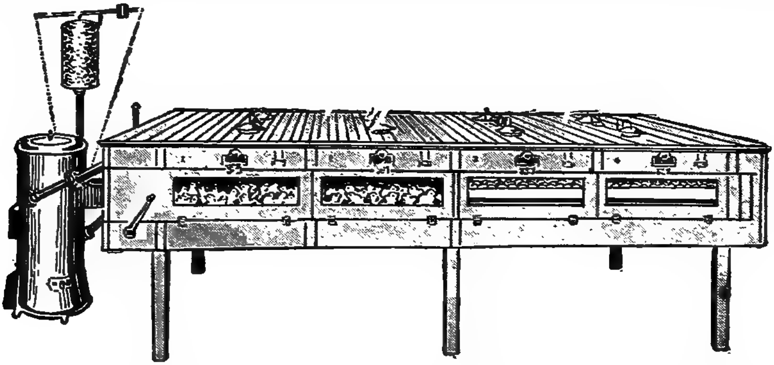
If you have no place that will compare with under the barn, for instance, where the hen would be likely to go, you must do the next best thing and make a suitable place.

I hatched some seven hundred chicks last year with hens and had quite a number of hens bring out every egg, and I will tell you exactly how I had my hatching pen fixed. We took one of the open front scratching shed houses that was empty and made a platform two feet wide to run the whole length of each section. This platform was about 15 inches from the floor and was placed against the back of the coop, being separated into 15-inch spaces with temporary partitions 45 inches square. A five-inch strip is then nailed along the front of these partitions to hold them in place and to keep in the nest material. A couple of boards are then nailed on the top to form a sort of roof or top to the nests. The partitions are a little shorter in front than at the back so that these boards slant, which prevents the hens getting on top and sitting there. The top does not go back against the wall, as we prefer to leave an inch or so space

A Queen Incubator, with a portion cut away so that you may get some idea as to its mechanism.

for ventilation. A board the full length of the nests and about 7 inches wide is then fastened to the front top board by old pieces of leather, which serve as hinges. This board can be laid back on top when we wish the hens to be at liberty. This door will be found necessary if a great many hens are to be set in the same building.. In our case, a number of hens are taken from other coops, and, being in a strange place, do not sit quietly at first. If there was no door, they would be liable to jump off the nests when you enter the room. The nests being constructed, the next step is to select the material to use in them. Our hatching house has a double board floor, is off the ground about a foot, and the front is practically open; therefore there is very little moisture. To imitate the conditions of the place that the hen in her free state on the farm would choose, we must supply moisture in some way. A piece of sod the size of the bottom of the nest is cut, two or three inches thick, and placed in each nest, with the grass side down. If the weather is very warm, this sod is thoroughly wet, then straw is placed on top of it and the nest shaped, being careful not to have the nest so deep that the hen has to step down into it, nor so shallow that the eggs will roll out. We aim to make it just deep enough to hold the eggs together. In the center there should be about an inch of straw on top of the sod. After the straw is placed in the nest, a couple of handfuls of chaff is scattered over it to make it more compact and solid—then the nest is ready.

If the hen is broody and you have to wait for the eggs, give her a thorough dusting with a good commercial lice powder and put her on the nest, using a couple of china eggs. Move them just after dark, then they will have the whole night in which to become accustomed to their nests.



This is a Mammoth "Blue Hen" Incubator. The two sections shown hold 2,400 eggs You can add additional sections and increase the capacity to any size that you may wish. This machine has a turning device so that all eggs in the machine can be turned at once.

They are generally all right by morning, but should have the door shut down on them.

The next morning take a peep at them, but go gently into the pen, as they are very easily frightened at this time and may change their minds about sitting in a second. Slip in quietly and see if they have all settled down, or if they are standing up. Sometimes you will find one that is determined to get out. In that case you would better select another hen. We will suppose that you found your hens willing to sit and that the eggs have arrived. The first care you owe them is to unpack them carefully and stand them in a cool, dark place for about twenty-four hours, to allow the small fibers that hold the germ in place to return to their normal position after being jarred for a day or more on the road. After the eggs have stood twenty-four hours, the hen should be taken off the nest and given a good feed of corn with grit and fresh water, and a place must be provided in which she can dust herself. The dusting box should be in the hatching coop. Then she should be placed back on the nest and the eggs slipped under her.

Do not bother her then for two days. After that open the door, and if she does not wish to get off, take her off and shut the door so that she must remain off the nest for fifteen minutes. The length of time that she is allowed to remain off the nest depends, of course, on the weather. In the warm summer days she can be off an hour and do no harm.

### KEEP THE EGGS CLEAN

If you have set a number of hens, you will be safe to take with you a little warm water; for invariably you will find that some hen has broken an egg or two or soiled her nest. You will have to remove the nest material and wash the eggs that are soiled. To neglect in this matter may be traced many a poor hatch. No matter how faithful a sitter a hen is, if the eggs are smeared, she can not hatch them. It is with the germ in the egg as it is with you in your living room. If some one were to stop up all the holes in the room so no air could get in, you would gradually grow weaker as the oxygen in the air became exhausted. The pores in the egg-shell are for the purpose of supplying oxygen to help develop the little chick, and when these pores are closed, the development stops, of course.

After the nests are all cleaned and the hens have been off long enough to have a little exercise and enough to eat, open the door and let them go back. We always set a number of hens at the same time and let them off together. We believe it does not matter which nest they go on.

A Standard Cyphers Incubator, showing the drop bottom let down. These are an advantage in very hot weather, and also in cases where the movements of the air is sluggish or insufficient for best results.

They are taken off the nest every day until it is time to hatch. On the tenth day they are given a good dusting with lice powder and again on the eighteenth day. The lice must be kept down if the hen is to have a good hatch, for a hen cannot attend to her work if she is bothered with either lice or mites. Besides, you want the chicks free from lice when hatched.

During extremely dry weather, water should be slopped around on the floor under the nests every day, after the hens have returned to their nests.

### NUMBER OF EGGS TO SET

A common fault is to try to have the hen cover too many eggs. We have always advocated thirteen eggs and when we set choice eggs we always use that many. Almost any ordinary sized hen can cover fifteen eggs, but if the same hen is given only thirteen eggs, I believe she will bring the chicks out closer together and the chicks will be stronger. A great deal depends on the weather. The colder the weather the less eggs a hen can cover successfully.

In case the eggs you have ordered arrive before the hen or hens are ready, keep the eggs in a cool place and turn them half over every other day. If you do not keep them over ten days and the eggs were fresh when they were shipped, you can still expect a good hatch. If you follow the above directions and do not get a fair hatch, you are not to blame.

### TEMPERATURE OF EGGS UNDER HENS

We know that the blood temperature of a hen during the incubating period is 107 degrees, and we also know that the blood temperature of a normal human being is 98 degrees, therefore, when we felt of the egg after the first twelve hours of incubation, the temperature was between 98 degrees and 107 degrees on one side and much lower than 98 degrees on the other. Furthermore, we found that the side of the egg that is in contact with the hens body will become very nearly as warm as her body, which at the surface is about one degree less than her blood temperature.

The following table gives the temperatures as nearly as they can be determined, at different stages of incubation:

| Day | Temperature of that side of egg in contact with warmth | Temperature of that side of egg farthest away from warmth |
|---|---|---|
| 1 | 102 | 90 |
| 2 | 104 | 92 |
| 3 | 105 | 94 |
| 4 | 106 | 96 |
| 5 | 106 | 98 |
| 6 | 106 | 99 |
| 7 | 106 | 100— |
| 8 | 106 | 100+ |
| 9 | 106 | 100½ |
| 10 | 106 | 101 |
| 11 | 106 | 101½ |
| 12 | 106 | 102 |
| 13 | 106 | 103 |
| 14 | 106 | 104 |
| 15 | 106 | 105 |
| 16 | 106 | 105+ |
| 17 | 106 | 105½ |
| 18 | 106 | 105½+ |
| 19 | 106 | 105½+ |
| 20 | 106 | 106+ |

You will note from the above figures, the nearer the approach to hatching time the more nearly the temperature reaches the same degree on both top and bottom of the egg.

### ARTIFICIAL INCUBATION

ARTIFICIAL INCUBATION DEFINED.—Artificial incubation may be defined as, "The production of young from eggs by other than natural means." The maternal instincts of the mother bird have nothing to do with bringing the young into the world. The conditions surrounding the eggs during the period of incubation are man made and man controlled. In the making and regulating of these conditions, Nature is imitated as closely as possible, with varying degrees of success.

The following requirements are necessary to successful incubation by artificial methods:

1. A first-class incubator.
2. A favorable location.
3. Suitable eggs.
4. Intelligent care.

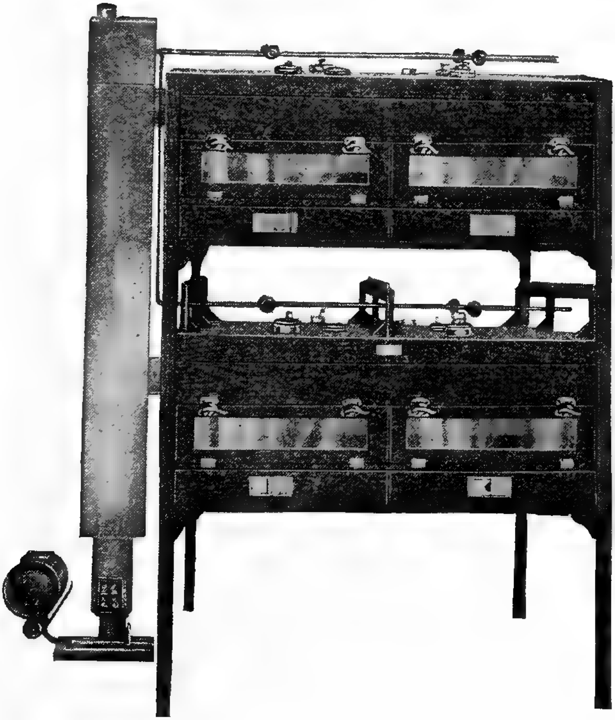
Missing Page

you want them to be. Four hatches is about all that can be expected of a single incubator per season, February to May. Allowing for eggs that do not hatch and chicks that die before maturity, about fifty mature chickens per hatch from a 100-egg machine are all that can safely be counted on, or two hundred chickens for the season. If you wish to raise, say one thousand chicks, you will need five times the above capacity.

Instead of buying five 100-egg machines, however, you will find it decidely to your advantage to buy two 250-egg machines, for several reasons. First, you will get the same egg capacity for less money, although the difference in this respect will not be great. In the second place, the larger incubators are more economical to operate. The small machine requires more oil in proportion to its size. Also, since it takes no more time to care for a large lamp than a small one, the time required to clean and care for three lamps daily will be saved by buying two large machines rather than five small ones. In the third place, the temperature in a large incubator tends to remain more uniform. The smaller the machine the more quickly is it affected by changes in the temperature of the room in which it is kept.

## SELECTING AND BUYING AN INCUBATOR

Selecting an incubator is somewhat like selecting the variety of poultry which you will breed. Look them over carefully, and then pick out the one which suits you best. There are scores of incubators on the market, most of them good, but some better than others. Since every manufacturer strenuously asserts that his is the best machine in the world, one needs to use his own judgment and common sense in deciding which one of the "best" incubators he will buy. The cheapest incubator



The double decked Schwalge-Smith Incubator. Sections can be added to this machine and its capacity increased to 9,600 eggs.

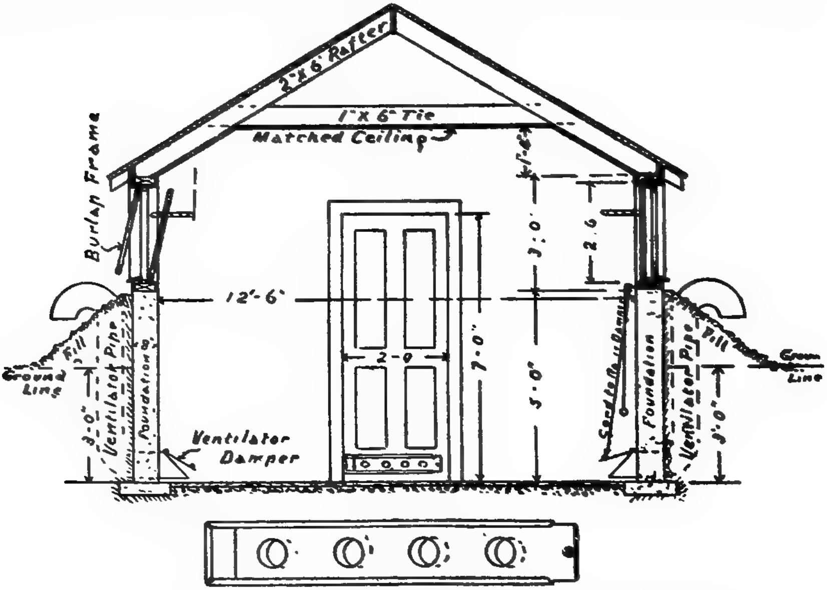
in price is sometimes the most expensive in the end. Any sort of tin or wooden box may be fitted up so as to hatch eggs, but that does not necessarily mean that it is a good incubator.

The same general rule holds true with incubators as with other classes of goods; those which are most widely advertised, and which have been extensively advertised year after year, are usually the best. If they were not giving satisfactory service, the fact would soon become known, and it would no longer pay to advertise them.

Do not be governed entirely by price. Good material and workmanship cost money. Money saved on the first cost may prove a dear investment if the incubator is short lived, easily affected by slight changes in temperature, etc. On the other hand, paint, varnish and "trimmings" won't hatch chickens, but they do cost money. Keep your eyes open. Read and compare the various catalogs carefully. Talk to your neighbors who have incubators, and you will not go far wrong.

## LOCATING THE INCUBATOR AND THE INCUBATOR ROOM

The ideal location for an incubator is a room designed especially for that purpose. An incubator room is an indispensable part of any well



*Enlarged Detail—Door Ventilator Slide Partly Open*

INCUBATOR CELLAR—CROSS SECTION.

Cross section of an incubator room or building. Please note the ventilator at the bottom of the door. Also the ventilators in the side wall. These can be made of tile or galvanized iron. Also note the arrangement for the windows so as to admit ventilation and keep out sunlight. This building should be built into a hillside, or else built entirely above the ground. Without ventilation near the floor or below the level of the eggs, you cannot expect the best results. We also like to have an opening made in the ceiling about every 20 feet for additional ventilation. These openings should be made two or more feet square. It is a good idea to have the opening covered with a sliding door so that it can be opened two inches or two feet as seems necessary. The opening on the outside of the roof of the building can be covered with a Star or King galvanized ventilating cap. If you are to avoid death in the shell, pure air, and lots of it, is necessary in your incubator room at all times.

regulated poultry plant where several lamp heated incubators, or a mammoth one are used. An incubator room should be built partly above ground and partly below, providing the floor on the front end of the incubator room is on a level with the ground so as to insure ventilation near the floor. This makes the room warmer in winter, cooler in summer, and of a more even temperature all the time. In building an incubator room, special pains must be taken to insure as nearly perfect ventilation as possible without draughts. One of the most important factors in successful incubation is an abundant supply of oxygen for the developing chicks. This requires a never ending supply of pure, fresh air.

Where one has but one or two lamp heated incubators, it is, of course, out of the question to build a special incubator room or building. The next best place in which to put the incubator is a well ventilated and light dwelling-house room where a fairly uniform temperature prevails both day and night. In any case the room selected should allow for ample ventilation without a direct draught on the machine. The incubator should also be placed so that the direct rays of the sun will never shine on it.

We think an incubator room or building should be built above the ground, so that the room may be ventilated to the floor. If you can select a location for the incubator building so that the rear part may be partially under ground, the room can be more easily kept at a uniform temperature. We like this plan best if the lay of the ground will permit of such a plan. If you are forced to build the room either all in the ground or all above ground, we would recommend that you build it all above ground. Construct and insulate the walls in some way so as to avoid as much variation in temperature as possible during changeable weather. It is much easier to keep an incubator room above ground in a sanitary condition than one deeply under ground. An incubator should never be operated in a room where young chicks are being brooded and reared.

## THE INCUBATOR HOUSE

One of the best incubator rooms or buildings which we have seen illustrated and described is as follows:

"Incubators can be operated successfully under a wide range of conditions, but, whenever possible, it pays to provide a suitable room or building exclusively for them. Better results will be secured and with much less trouble. A cellar built after the above plan will be well lighted and ventilated, uniform in temperature, and will afford just the conditions required for best results. It can be built at comparatively little cost and the plan may readily be adapted to accommodate any desired number of machines. The outside ventilator flues may be of galvanized iron or tile.

An exterior view of the Hollywood Ranch Hatchery at Van Nuys, Calif. This is a brick building with double layers of brick and an air space between each layer. You will note the ventilating holes near the ground on the outside of the building. These pass up between the walls for a short distance and then open into the room. There are electric fans in the ceiling and they force the bad air out through the ventilators shown on top of the shingle roof. A building of this sort, built above the ground, is very much superior to an incubator room in the ground.

If preferred, an ordinary stove damper may be used to control the circulation for air.

"For every 100 square feet of floor space, there should be one ventilator flue, extending to within six or eight inches of the floor. This should be at least eight inches in diameter if made of galvanized iron, or six by six inches, inside measurements, if constructed of boards. It may be placed either inside or outside of the wall, the outer opening being just above the level of the dirt which has been banked against the walls. This opening must be protected from the elements.

"The opening near the floor level should be provided with a slide or a regular stove-pipe damper for the purpose of regulating the flow of air when necessary. Ventilators of this kind should be placed on opposite sides of the room. Top ventilation should be secured through the windows, the sills of which should be about 5½ feet above the floor level. The sash should be hinged at the bottom and a top provided to give the desired amount of ventilation. To prevent strong air currents, screens made of burlap may be placed in window frames outside of the sash.

"Our experience has been that a building of this type will keep the proper temperature and humidity at all times during the hatching season if the ventilation is properly regulated. Such an incubator house as is here described can be constructed at a nominal cost if the floor and walls are made of concrete, as sand and gravel can usually be secured at slight expense. If the poultryman does not understand the making and pouring of concrete, there is generally some handy man in the neighborhood who does. If it is impossible to have a house of this description at present, aim to approach ideal conditions as nearly as circumstances will permit. It is possible, at least, to provide good ventilation, and that is highly important.

"The incubator must not be located in a room in which there is artificial heat, or the matter of ventilation will require even more attention, because a stove, a furnace, or fireplace consumes a great deal of oxygen in addition to drying out the air. While the average outdoor humidity ranges from 65 to 85 per cent, the humidity in the average home during the winter is only 25 to 35 per cent, a condition which physicians tell us is responsible for a large percentage of sickness during cold weather.

"It is self-evident that incubation, which has to do with the creation of life, should not be attempted under conditions, as regards humidity, that are so fatal to robust human beings. If hatches are unsatisfactory and a lack of moisture is indicated, it may be advisable to secure a wet and dry bulb thermometer and find out the degree of humidity existing in the room or cellar in which the incubator is being operated.

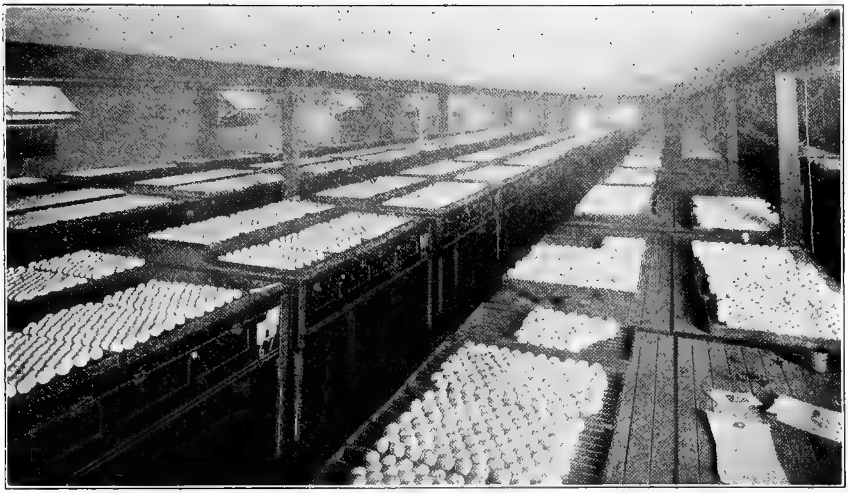
## FACTS CONCERNING THE INCUBATOR ROOM

It is possible to operate incubators in any unheated room with a solid floor, provided the temperature does not go below 40 degrees. The best place, however, is in a well ventilated room or building where the temperature is not so changeable. The well insulated incubator is better adapted for running in rooms where the temperature is variable.

The circulation of warmed air through the good hot air incubator is slowly downward and no cold air is permitted from the floor. That which comes through the floor works its way through the burlap bottoms. The air is taken in through the jacket, warmed and spread out over the eggs.

Drafts or direct sunlight should be guarded against. The ideal temperature of the outside room is from 50 to 70 degrees. The room should have proper ventilation. When ventilation is faulty, it is posible to have a fair hatch, but the chicks will die soon after being placed in the brooder. The incubator uses the fresh air of the room, takes up the oxgyen as do the human beings, to supply the growing embryos.

The air of the incubator room becomes devitalized and filled with fumes, which should not be re-used by the machine. The chicks suffer as would a human being shut up in a room with the gas turned on.



This shows the interior of the Hollywood Ranch Hatchery at Van Nuys, Calif. This building is 50 by 100 feet on the inside. The fresh air is taken in through the ventilators between the double brick wall and is forced out by fans placed in the ceiling. With this system, the air in the room is under the absolute control of the operator, and chicks can be hatched as successfully in August and September as in other months of the year.

## TAKING FUMES FROM ROOM

The accompanying diagram illustrates a system of taking fumes from an incubator room, which an ordinary workman can install. This is arranged and works on the same principle as the drafting of a stove or furnace; that is, a line of pipe is extended through the basement and terminates in the flue, the same as the smoke pipe from a stove. Instead of the fumes from the incubator lamps scattering and remaining in the basement, they are drawn by suction into the ventilating pipes, whence they pass into the flue. It is necessary to cut a hole in the flue by removing half of one brick, but this is a simple matter, and in no way impairs the flue. After the pipe is inserted in the hole, the crevices should be filled in carefully with cement.

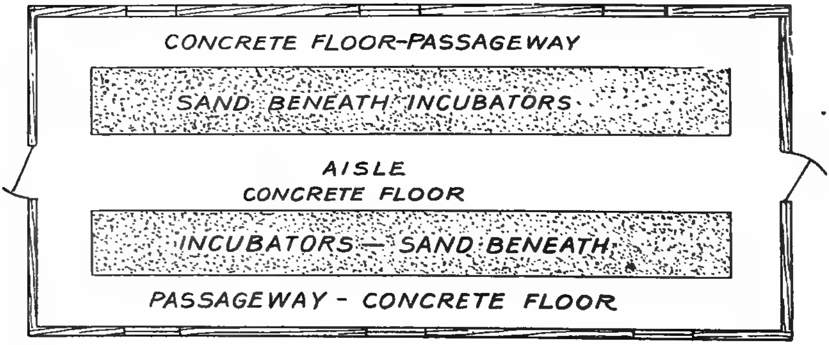
The system here described consists of a pipe line built up of ordinary three inch stove pipe, so arranged as to serve the number of machines in use. This line of pipe is secured to the floor joist by means of wire clamps fastened to staples. It is very necessary that a snug fit be made at each joint of the pipe, and that sufficient wire clamps be used to hold the pipe line firmly against the joists.

This arrangement of piping may be extended to accommodate an unlimited number of machines or as few as desired.

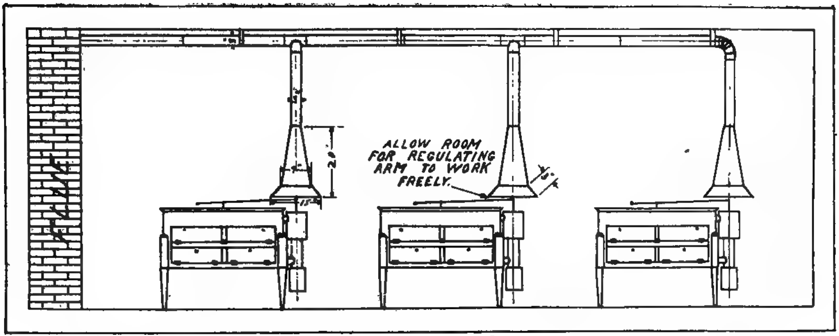
Above each incubator to be served, a tee connection is cut into the pipe line. To this there is attached a funnel shaped drop pipe, measuring three inches in diameter at the top and gradually increasing to a diameter of nine inches at the bottom. These drop pipes are made of ordinary IX tin with lap seams bolted together by three-eights inch stove bolts. Rivets can be used for this purpose, but they are not so convenient to apply, and do not make so neat a job. In using bolts it is necessary that those with screw heads be obtained, in order that they may be held from turning when tightening the nuts.

**The drop pipes should be of such length as to terminate about three inches above the top of the heater, so as not to interfere with the freedom of the regulator.**

This shows the exterior of the Smith Hatchery at Cleveland, Ohio. You can see that it is a large brick building, so arranged that through the use of electric fans on the interior there is a perfect circulation of air, necessary for hatching. There is also room in this building for offices, the handling of eggs, and the boxing and shipping of baby chicks. Thousands of hatcheries are springing up all over the United States, and the probabilities are that chicks will be sold at very low prices, and as a result a great deal of inferior stock will be offered through these chicks. For that reason, we would warn all hatcheries to try to put out a good quality of chicks, and charge a reasonable price for same. This particular hatchery shown above sells hundreds of thousands of baby chicks of several varieties, all from pure-bred stock.


CONCRETE FLOOR-PASSAGEWAY
SAND BENEATH INCUBATORS
AISLE
CONCRETE FLOOR
INCUBATORS — SAND BENEATH
PASSAGEWAY - CONCRETE FLOOR

In order to get sufficient moisture into the air of an incubator room where the climate is somewhat dry, it is a good idea to put a concrete floor in your incubator room, but leave a space in the floor almost the width and length of your incubators, which is not covered by concrete. Four or five inches of soil can be dug out and the space beneath the incubators filled almost to the level of the floor with sand. Water could then be sprinkled or poured into the sand pits. They will hold the dampness, and the moisture will be distributed in this way. If you have a concrete floor over the entire room, a box can be made underneath each incubator, which is 4 to 6 inches in height, and these boxes filled with sand, and the sand can be moistened. The legs of the machine should extend over the sand boxes on to the edges of the concrete floor. If water is piped to the incubator room, the hose can be attached to the water system, and the sand moistened with same.

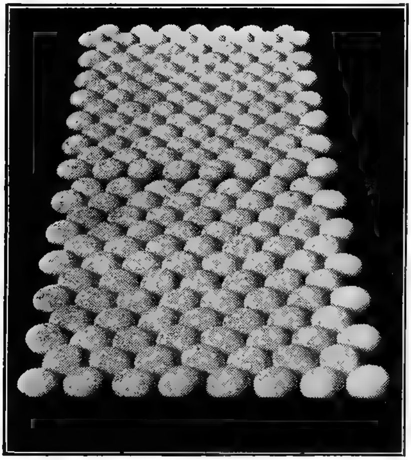


AN ARRANGEMENT FOR CARRYING AWAY FUMES FROM INCUBATOR LAMPS.

## THE EGGS

It goes without saying that a hatchable egg is as necessary an adjunct to successful incubation as a good incubator. All fertile eggs are not hatchable eggs. An egg may be fertile—that is, it may contain the germ of life, but the germ may be so weak that even perfect incubating conditions will not enable it to develop into a live chick.

It is evident, then, that in order to secure eggs which will produce strong, vigorous chicks, special attention must be paid to breeding stock.



Trays of beautiful uniform eggs, suitable for hatching. Remember that 50 per cent of poor hatches and incubator troubles are due to the eggs and breeding stock, and not due to the machine itself. Therefore, be very careful in handling, feeding, and mating your breeding stock; also in the selection of the eggs themselves.

The breeders must be mature, and in good condition. Immature, old, fat, sickly, or lousy stock or hens that have been forced for winter egg production, cannot be relied upon to produce strong, hatchable eggs. They must be provided with comfortable houses admitting an abundance of fresh air without draughts. They must be furnished with plenty of pure water and grit, and be compelled to scratch in a deep litter for their grain food. Avoid fattening food, and feed plenty of green food. Provide one male for every eight hens of the Asiatic breeds, ten hens of American breeds, and twelve hens of the Mediterranean breeds if they are kept penned, and twice this number of hens with each male if they are on free range.

## FRESHNESS OF EGGS

In every test that we have ever made, we got best results from eggs which were set as soon after being laid as possible. While old eggs will hatch, they depreciate in hatching value each day they are held. There will be more dead germs, more die in the shell, and less vitality in those which do hatch.

One of the presidents of one of the biggest incubator companies recently said this:

"It has been my privilege to be closely associated with the hatchery business since its first inception, and by reason of my great interest in the poultry industry as a whole, and the development of incubators in particular, it has been a part of my work to make a study of those things which increase or detract from the percentage or quality of the chicks that are hatched for commercial purposes.

"During the course of many investigations and experiments, we learned in a general way that stale eggs did not produce hatches which were as satisfactory as fresh eggs.

"The results from the eggs from one to five days old placed under incubation showed no difference in the percentage of hatch or in the quality of the chicks, but eggs placed under incubation from six to thirty days old show the percentage of chicks hatched decreased at the rate of four per cent a day and the quality of the chicks showed such a marked decrease that it was plainly noticeable after the eighth lot of eggs had been hatched.

"We have frequently heard and read statements by incubator authorities that eggs can be hatched satisfactorily until they are anywhere from fourteen to twenty-one days old, and I am not prepared to dispute that statement when the eggs are stored under certain favorable conditions, where they are not subjected to the same degree of evaporation which takes place under normal conditions, such as usually prevail in the average hatchery. It will, therefore, be well for hatchery owners to disregard such statements, since we know the average eggs delivered to most hatcheries are not stored under these unusual conditions.

"After finishing my experiment, which covered thirty hatches, with eggs from the same lot that were set one day apart, I determined to learn just how much difference it would make in the results secured from a practical commercial hatchery and, with that end in view, I instructed the managers of three hatcheries, in which I am interested, to refrain from placing under incubation eggs that were more than a week old. This was rather a drastic order, but it only required the results from the first hatch to convince the men in charge of these plants that the setting of perfectly fresh eggs was well worth while.

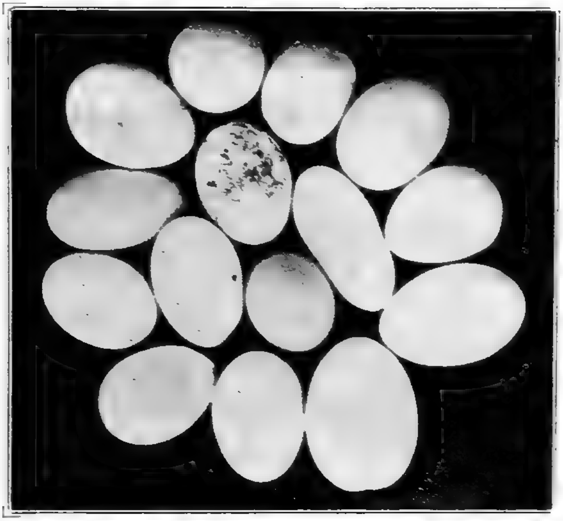
"As a result of my instructions to set no eggs over a week old, we increased the percentage of chicks produced by those hatcheries, six, seven and eight per cent, respectively, the first week, and within a month we had actually increased the percentage of chicks hatched a little more than 10 per cent. In addition to increasing the number of chicks, we also improved the quality of the chicks to such an extent that the number of chicks that were unfit to ship was reduced to a fraction of 1 per cent.

"With these figures at our command, it will require no argument to show how the profits from every hatchery can be materially increased by refusing to place eggs under incubation that are more than a week old. It has been my experience that it is only necessary to let the egg producers know the importance of delivering their eggs to the hatchery when they are absolutely fresh in order to secure their full co-operation and while it might involve a little extra trouble and expense, it will unquestionably be well worth while to exert every effort that might result in bringing the eggs to the hatchery when they are perfectly fresh.

"In my humble opinion, the practice of holding eggs over from one week until the incubators are set the following week is a wasteful and unprofitable practice which should never be followed, and if you will keep a record of the chicks produced from eggs that are held over for an extra week, it will not be hard to satisfy yourself that you would have been ahead of the game by sending your left-over eggs to market.

## SELECTING EGGS FOR HATCHING

Eggs for hatching should be normal in size and shape, and as near the same size as possible—the fresher the better. If it can be avoided, do not incubate eggs of large and small varieties in the same machine at the same time—for instance, Leghorns and Plymouth Rocks. The shells differ in thickness and texture, and conditions which would be ideal for one would not be best suited for the other. Subjected to the same conditions, the Leghorn eggs would perhaps hatch twenty-four hours ahead of the Plymouth Rocks. If it is necessary to incubate eggs from large and small breeds at the same time, start the eggs from the heavy birds twenty-four hours earlier.



None of the eggs shown above should be used for incubation. They are irregular in shape and size and texture of shell, and if a chick should be hatched from any one of them, there would be a tendency for the chick to produce the same kind of an egg.

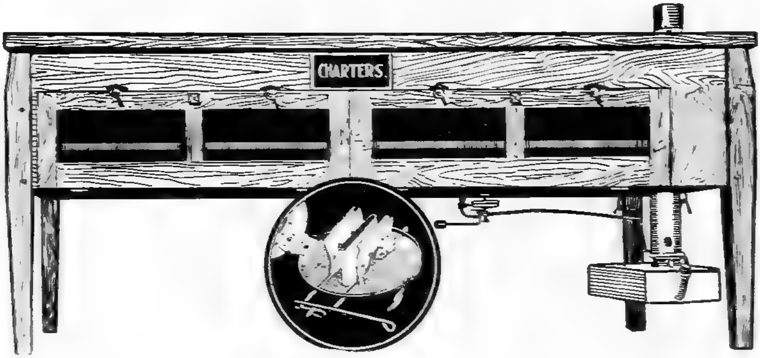
Discard all misshapen eggs and eggs with mottled shells. A misshapen egg or a mottled egg indicates an abnormal condition on the part of the hen that laid it. Such eggs are usually laid by hens that are overly fat or otherwise in a debilitated condition, and are rarely hatchable.

## CARE OF EGGS FOR HATCHING

Eggs for hatching should be gathered frequently, to prevent chilling in cold weather, and to keep the germs from starting to develop in hot weather, or on account of broody hens. They are best kept in a room with a temperature of 50 or 60 degrees. They should be turned daily. If eggs for hatching have been shipped to you, let them stand for twenty-four hours before placing them in the incubator.

## SAFEGUARDING HATCHABLE EGGS

Eggs intended for incubation are apt to be coddled during spells of severe weather, stored in too warm a place, with the result that they are rendered useless for hatching. Eggs placed in boxes on high shelves in rooms containing gas jets or fires are sure to be spoiled, owing to the fact that excessive warmth liquifies the albumen—so much so that the yolks, on whose upper surfaces are the life germs, force it aside, and the germs are brought into close contact with the lining membranes of the shells. The latter, being of a porous nature, are but poor guards against the drying influence of the outer air, and therefore the life germs they enclose either become weakened or fastened to them. A fresh egg contains sufficient aqueous fluid for the wants of the developing embryo during the period of incubation. If, through long or wrong storage, that fluid is reduced by evaporation, it means that the incubator must supply additional moisture; otherwise, the embryo will fail to develop, or, should development take place, the chick hatched will be weak and puny. The moisture supply of an incubator is not intended to build up a chick, but its mission is to surround the egg with humid air, and so prevent undue evaporation of the aqueous element of the egg. Coming back again to the methods adopted by the hen that strays away and fashions her nest in the earth, we may learn a helpful lesson on the storage of eggs. Did you ever know a hen to fashion her nest on the sunny side of a hedge-row or haystack? No; the hen knows better than to expose her already overheated body to the glare of the noonday sun. In taking care of herself by making her nest on the damp and shady side of a hedge-row or other sun screen, she not only secures comfort for herself, but safety for her eggs, the latter being kept cool, whilst the damp earth beneath them obviates the risk of evaporation of their watery constituents taking place from the time the first egg is deposited until incubation begins.



The Charters Incubator. One of the main features of this machine is the fact that the heating device is controlled by thermostats on both the inside and outside of the machine. If the temperature in the room varies during the day, it affects the temperature of the machine. The thermostats inside and out help to take care of every condition which may arise as far as heat and cold is concerned.

If it is necessary to store eggs till a sufficient quantity is available for incubation, they should be placed in boxes, and the situation of the boxes should be a cool one, certainly not higher than 55 degrees. If the air temperature surrounding the eggs is not below 45 or higher than 55 degrees, storage will be within safe limits. Eggs should be placed on their sides and turned daily. The eggs lie on their sides in the naturally fashioned nest, and each time the latter is visited with the object of laying, the hen gives her eggs a shuffle, and so prevents their life germs from adhering to the shell. Copy Dame Nature in the handling of the eggs under storage—that is, as far as you possibly can copy her—and don't swallow everything you hear or read concerning the position in which eggs should lie in the store boxes before proving that eggs stand on either their narrow or broad ends in the natural nest. Dame Nature is no theorist, but a practitioner and a teacher. Copy her as far as lies within your power, and you will not go far wrong in the handling of hatchable eggs.

Respecting the length of time eggs can be kept in good hatchable condition, I may say that for use either in incubators or under hens it is as well to get them set as soon as possible after they are laid, and have cooled down, as undoubtedly the fresher they are when set the stronger will be the chicks produced. But in making comparisons between the sunmmer and winter storing of hatchable eggs, I have proved over and over again that those from vigorous and rightly mated stock will keep in hatchable condition longer during the winter time than during the warmer seasons of the year. The reason for this is no doubt traceable to the fact that the life germs of the eggs are maintained in a dormant condition by the cooler atmosphere, whilst the latter, being more humid, prevents absorption of the aqueous contents of the shells. If eggs must be stored to enable one to fill an incubator of high holding capacity, do not coddle them by storing them in too warm or dry a position, but keep them on the cool side of 55 degrees, and turn them once a day to insure their life germs against adhesion to the shell. It may be imagined that I have harped too much upon the importance of careful egg storage, but I do not think so, simply because I am convinced in my own mind that thousands upon thousands of eggs are rendered useless for incubation through being indifferently cared for before being set. What the would-be producer of early chicks should aim for is the strong, vigorous youngsters—the ones calculated to withstand the climatic conditions attending the rearing of birds hatched during the winter; and the mark will be hit if the eggs, before they are set, are guarded against sudden chills by being collected from the nests as soon as possible after they are laid, and if such eggs are rightly stored. If you get bad hatches, don't blame the breeding stock or the incubators before asking yourself whether or not you handled the eggs in a sensible manner prior to setting them.

## WHEN DOES INCUBATION BEGIN?

The incubation of the egg begins before the egg leaves the hen's body. The germs that have united are subjected to the heat of the hen's body during the period of fifteen to twenty hours before it is laid. When the egg enters the oviduct, there is only one cell, but before it is laid the blastoderm has two layers or cells. It is a wonderful thing that this growth can be suspended and be kept a number of days before it is placed in the proper heat to keep the germ of life growing.

These germs in the eggs do not always grow, but often die at different stages. They can remain away from the heat so long that there will not be enough vitality to start it to growing, and the germ of life dies before it ever reaches the hen or the incubator.

It can be killed from sudden jarring or even by a sudden thunderstorm, in the opinion of some authorities. It is rather a peculiar thing that a growing chick that is developed within a shell could be disturbed in this way, but it is true that they will often fail to hatch on account of atmospheric disturbances.

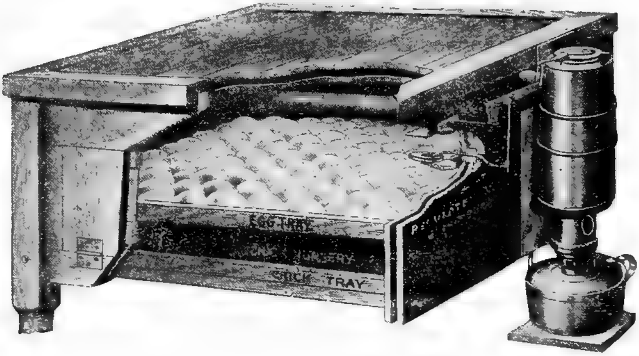
Just how long they can remain out of proper heat and yet hatch is a hard question to answer. In the early days of artificial incubation it was thought that five or six days was the limit, but with the modern hatcher this is not true. They will sometimes hatch when three weeks old, but it is better not to keep eggs for more than ten days to two weeks at the outside. It is generally known that the old hen that steals her nest and lays out her clutch of eggs will hatch better than a hen that has eggs placed under her only a few days old. It takes some time for her to complete laying, and, furthermore, she warms up the eggs every time she goes on the nest to lay.

## DISTINGUISHING THE SEX BEFORE EGGS ARE INCUBATED

Some people have claimed, with a great deal of positiveness, that a round egg will hatch a pullet, while a cockerel will be hatched from a long, pointed egg. These long, pointed eggs usually hatch chicks of low vitality, and we are not certain that in some cases crooked backs cannot be traced to these very long, slender eggs. Repeated careful tests have proved, however, that the shape of the egg has nothing to do with the sex of the germ which it contains. No sign or exterior indication of any kind has thus far been discovered that will enable us to forecast the sex of an unhatched chick with any degree of certainty. Some claim that eggs which have raised, circular, and zig-zag marks on the end of the egg-shells will hatch all cockerels, and that eggs with shells which are perfectly smooth and free from these marks on the end will hatch all pullets. These marks may indicate that the shell may be responsible for the amount of air, moisture, and heat which reaches the developing embryo. The amount of these three elements may influence or help determine the sex. If all of this be true, then the marks on the end of the egg-shell may be an indication of the sex.

In the case of bees, we are told that if the bees lose their queen by death or otherwise, the bees will go to some cell and will feed and nurse that developing bee in such a way that the sex is changed from an ordinary bee to a queen. If this is true with bees, it may be that the amount of air, moisture, and heat may have some influence on the sex of a chick.

All sorts of devices for determining the sex of eggs before incubation are offered for sale, but they are all fakes, so far as I have been able to determine.



A Sure Hatch Incubator with a portion cut away so that you might see the arrangement and construction of this machine.

## TESTING FOR FERTILITY BEFORE INCUBATION

Several methods of telling whether eggs are fertile or infertile before they are incubated have been advanced. One method requires that you touch each egg to the tip of your tongue; it is claimed that the fertile eggs will feel slightly warmer. By another widely exploited method, each egg is placed in a small instrument and immersed in water. This is merely a test for specific gravity, and enables the stale eggs to be distinguished from the fresh ones. No test for specific gravity can enable one to distinguish fertile eggs from infertile eggs before they are incubated. This is an indication of freshness and fullness only, and not of fertility. The egg which is heaviest and sinks in the glass of water is the freshest and fullest egg, but it might also be infertile.

Electric devices and various patents and schemes are offered for sale, but, so far as we know, they are all fakes, and there is no method of determining the fertility of an egg until it has been incubated.

## SETTING UP THE INCUBATOR

First uncrate the machine carefully, making sure that all parts are present, and that none have been damaged in shipping. Where two or three machines have been received at the same time, keep the parts which come with each machine separate, as the parts on some makes are especially fitted to the machine with which they are sent.

To put on the legs, lay the incubator on its side. Then screw the legs on the lower corners, being careful to place them snugly over the corner, and see that the shoulders of the legs are pressed firmly up against the bottom. Then turn the incubator over and repeat the operation.

Next, place the incubator where it is to stand and level it carefully. This is important regardless of whether the machine is heated by hot air or hot water. Unless it is perfectly level, it will not heat evenly.

After the incubator is properly placed, follow the manufacturer's directions carefully in placing and adjusting the thermostat, regulator, and heating apparatus. These vary so widely that it is impractical to attempt to give any general directions concerning them.

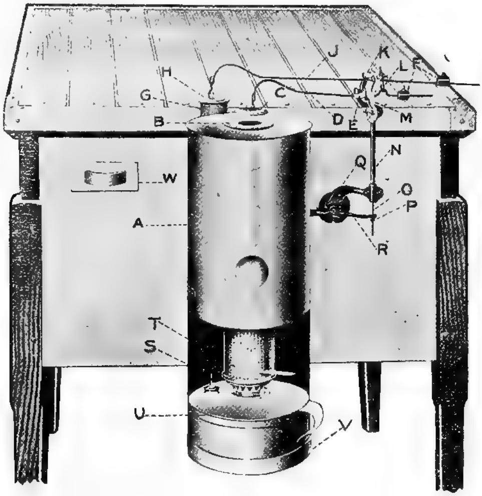
## SEE THAT YOUR MACHINE IS LEVEL

If one end or one corner of the machine is higher than another, it will be hottest at the highest point. The air varies in temperature about two degrees for each vertical inch in the egg chamber. If the machine is heated by hot water, in order to have the proper circulation of water, the machine must be level. This factor is of sufficient importance so that you should have a spirit level and make certain that your machine is properly leveled.

## STARTING THE INCUBATOR

If the incubator is a hot water machine, the first thing to do is to fill the boiler. Fill it slowly, giving the air plenty of time to come out, and be sure it is full—provided you fill it with warm water. Using warm water saves kerosene and at the same time heats the machine up more quickly. If cold water is used, do not fill the tank entirely full until after the water is warmed. Cold water expands in heating, and the tank will run over if filled full to start with.

Next, fill the lamp with the best grade of kerosene you can buy, as it burns with a hotter, clearer flame, and there is less danger of smoking. See that the wick is well saturated. Trim the wick square across, using the wick tube as a guide. Then turn the wick up a little, and snip off both corners. If this is properly done, the flame will appear full, round and clear.



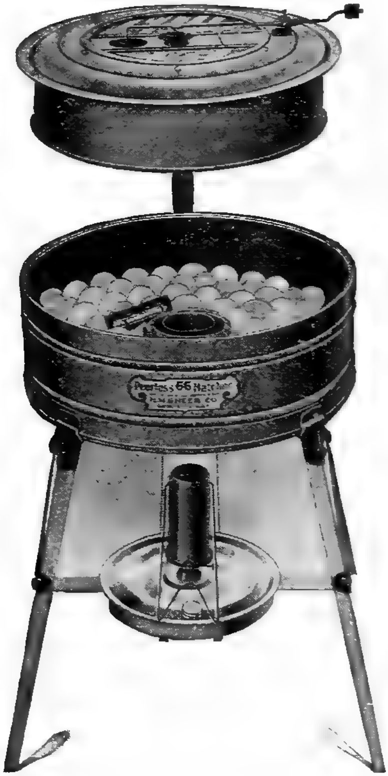
End view of Incubator, showing parts of the heating and regulating apparatus. A—Heater. B—Perforated Cylinder. C—Damper for Heater. D—Arm Carrying Heater Damper. E—Knife-edge Balance. F—Balance Weight. G—Moisture Pipe. H—Damper for Moisture Pipe. J—Arm Carrying Damper for Moisture Pipe. K—Knife-edge Balance. L—Upper Adjustable Rod and Nut. M—Double Yoke. N—Connecting Pipe. O—Lower Adjusting Rod and Nut. P—Arm. Q—Bracket. R—Adjusting Nut. S—Lamp Hanger. T—Chimney. U—Lamp. V—Lamp Hanger.

In starting the lamp, turn the flame low until the lamp and heater are warmed through. A new wick will cause the flame to "run up" after it has been burning a while. If it is turned high at the start, the flame is very liable to smoke.

Do not be in too big a hurry for the incubator to reach the proper temperature. From five to eight hours is usually required. Be sure that the thermostat damper is clear down, so that the machine gets all the heat while it is warming up. When the thermometer registers about 102 degrees, the thumbscrew regulating the thermostat damper should be turned down until the damper is raised just a little. If the temperature continues to go up, turn the screw a little more, thus raising the damper a little higher. If it falls, lower the damper a little. Continue to regulate until the thermometer stands fairly steady between 102 and 103 degrees. After that, the thermostat should do the rest.

## DAILY MANAGEMENT OF THE INCUBATOR

When you start a new incubator for the first time, or an old one for the season's first hatch, it is a good plan to run it empty for twenty-four hours in order to make certain that the thermostat is working properly and that you have the regulator accurately adjusted. Many hatches have been ruined by the operator being in too big a hurry to get the eggs into the machine. After you are once sure that you have the regulator properly adjusted, **leave it alone.** If the damper is inclined to stay up, and the temperature to run high, turn down the lamp a little, and **vice versa** if the temperature is inclined to run low. Under average conditions it should not be necessary to turn the flame high. In warm weather, or toward the latter end of the hatch, the flame can usually be turned moderately low.



The Peerless, 60 All-metal Incubator with a glass top.

## CARE OF THE LAMP

This is the most important and principal part of the daily care of the machine. Upon the thoroughness, carefulness, and regularity with which the work is done depends in large measure the success of the hatch.

The care of the lamp should not be divided between several persons, else it will surely be neglected sooner or later. The responsibility should rest upon one person, and that person should make it a regular rule to care for it at about the same time each day. It is best to care for the lamp each morning, so that it can be properly regulated before night, when there is no one to "keep an eye on it."

The daily care of the lamp consists in filling it, trimming the wick, and seeing that the burner is kept clean, especially the small holes around the burner through which the air circulates.

It is very necessary that proper care should be given to the lamp. This is the source from which the machine gets its heat and on which the success of the hatch will depend.

There should be a regular time set apart each day for trimming the wick and filling the lamp. The best plan is to handle the eggs first and then attend to the lamp. Oil stops the pores of the eggs and renders it difficult for them to hatch.

Great care must be exercised not to fill the lamp too full of oil. When the lamp is filled too full, the proper circulation of air and oil is prevented and the lamp goes out soon after being filled. There needs to be some space between the top of the lamp and the oil below. If the lamp does not fit up tight and an air space is left between the chimney and the lamp, the lamp will flicker and fill the incubator with smoke. There is a possible danger of fire, as the burner might melt off by the lamp getting too hot, and the fire reaching the oil might cause serious damage.

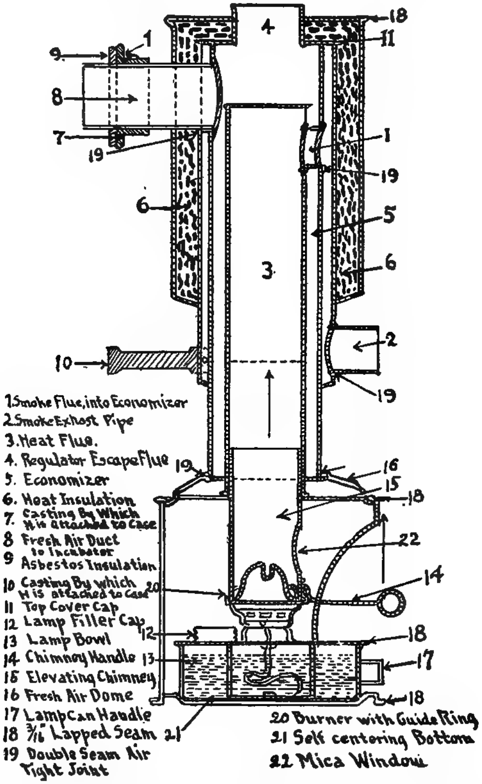


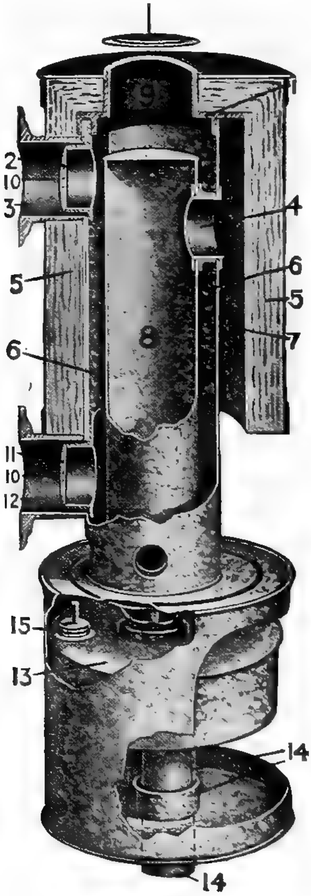
Diagram of the Prairie State Lamp and Heater used on Prairie State Incubators.

It is not necessary to trim the wick of the lamp each time. The charred portion can be removed with the fingers or a small piece of wood such as a match or toothpick. The center of the wick should be higher than the ends so as to keep the flame from having two points. Trim the corners just a little so that the flame will be slightly oval.

Drafts blowing in on the lamp will often cause the flame to go out. The incubator should be placed so that no drafts can reach the lamp flame. In some climates the lamp flame should be turned just a little higher in the afternoon if the temperature of the room is a great deal lower at night. But a good regulator on a good incubator will take care of most of this variation in temperature. The wick should be lowered in the morning if there is much change in the temperature of the incubator room during the day. After the flame is regulated, we never like to keep turning the wick up and down.

The lamp should be thoroughly wiped after filling and when first placed in the socket the flame should not be high at first, but should burn low for about five minutes, and then see that it is adjusted or turned to the height wanted.

C. N. Perkins of New Jersey recently wrote an article on this subject



Sectional View of Cyphers' Standard Fire-proof Incubator Heater with Safety Lamp Enclosure attached. 1. Top cover cap. 2. Castings which form fire and smoke-proof joints between waste-heat chamber and pipes connecting heater with interior of incubator case. 3. Casting by which heater is attached to incubator case. 4. Casting which connects direct heat flue (8) with waste-heat chamber (7). 5. Air-spaced asbestos jacket covering the entire exterior of the heater. 6. Fresh air chamber in which fresh air is drawn from outside the machine, is warmed by contact with the outer surface of flue (8), and carried into incubator at upper connection. 7. Escape flue for discharge of fumes from direct heat flue (8). 8. Direct heat flue. 9. Escape flue for surplus heat produced in fresh air chamber (6). 10. One-fourth-inch mesh wire protection against entrance of mice to interior of incubator case when machine is not in use. 11. Castings which form fire and smoke-proof joints between waste-heat chamber and pipes connecting heater with interior of incubator case. 12. Casting by which heater is attached to incubator case. 13. Top of lamp bowl. 14. Elevating device. 15. Filler cap and non-spilling air tube.

that was so full of helpful suggestions about the care of incubator lamps that we think it wise to give you the benefit of his advice as follows:

"In the first place, it is the height of folly to leave the incubator lamp, containing some kerosene, in its usual place in the heater part of the incubator. During the seven to nine months that the incubator is idle, this oil from the lamp is seeping all through the heater, onto the metal parts, and into the asbestos covering. Finally, the heater becomes thoroughly saturated with the oil. When the incubator is started the following season, it will smoke, and if the flame of the lamp gets at all high, soot will quickly collect on the entire heater. Sooner or later this soot will cake, and, as it partly dries, little pieces will fall down onto the lamp and these are very apt to become ignited. The writer has been requested frequently to look at incubators that smoke badly and which will not heat up. In nine out of every ten instances the cause has been that enumerated above. In one or two cases the writer found that even the lamp had not been cleaned at all and was simply saturated with oil, until it would smoke even when burned by itself, independently of being in the incubator.

"Before the lamps of either the incubators or brooders are lighted in the spring, they should be thoroughly cleaned. If they have been left clean from the previous season, the first cleaning in the spring need not be so particular. But if for any reason the lamps were not boiled out in water, they should be thoroughly cleaned with a rag, in every crack, corner, and crevice, and they should then be boiled out. This is accomplished by putting them into some metal receptacle and covering them with cold water. Into the water one should put about one teaspoonful of washing soda to every six quarts of water. The water should be allowed to come to a boil and then to boil quite hard. While still warm, the lamps should be taken out of the water and wiped dry, cleaning wherever is necessary at the same time. They should then be put on the back of the stove to dry. When dry, the burner and other parts, which should be taken apart from each other and from the lamp proper before they were put into the water, may be assembled.

"New wicks should be put into the lamps at the first of the season. It is poor economy, indeed, to use part of an old wick to save a penny and then some cold morning find that the wick is so short that the lamp went out during the night, even though the oil tank was but half emptied, and have this mean the loss of numerous valuable hatching eggs or chicks. Wicks cost but about ten cents per dozen, and as the lamps are burned frequent notice should be given to the length of the wicks. The wicks should extend down onto the bottom of the tank part of the lamp, and should be replaced with new ones when it is seen that they are not lying on the bottom of the lamp proper.

"When filling the lamps, care should be used not to fill them too full. The tank part of the lamps should never be entirely full of oil. There should be at least one-quarter of an inch space at the top of the tank. This will supply air as needed in the combustion of the oil, and also prevent the flame from jumping down into the tank and exploding. Besides this, it is much easier to keep from having the oil spill out around the burner collar when carrying the lamp to its destination, when the lamp is not filled too full than when it is filled beyond the limit.

"And a word about the quality of oil. The writer has no Standard Oil stocks, nor is he interested in boosting the sale of expensive oil, but he does advocate most strongly the purchase of the very best quality of oil procurable. In the first place, it will be found that the best oil will burn longer than poor oil. It will give a better and stronger flame and more heat than the cheaper grades. And it will also reduce very materially the item of labor.

"After each hatch, or, in the case of brooder lamps, at least every three weeks, the lamps should be taken out, the oil emptied out of the tank, and the entire lamp boiled out. When cleaned, new wicks should be put in and then little fear need be had of the lamps going out. Whenever one notices oil on the top of the lamps, it should be immediately wiped off, and if the burner seems full of oil that has seeped up, a clean lamp should be put in its place and this lamp cleaned and boiled out.

"To keep a straight flame on a lamp, the wick should never be cut. The blackened part of the wick should be scraped off by running a knife across the top of the burner, until all the charred part is scraped off. Then the knife should be laid flat across the top of the burner, covering the opening, and the wick should be turned up against the knife blade. This tends to thoroughly flatten and straighten the wick. If it is noticed that there are 'points' on the corner of the flame, or that the flame is uneven, by putting the knife blade on the top of the burner part, and turning the wick up against it a few more times, the flame will show a decided improvement.

"The mica in the chimneys of the lamps will become either discolored or blackened with soot, practically preventing one from seeing the flame. This is dangerous in that one may turn the flame too high. To clean the mica, put a little table vinegar on a rag and rub quickly over the mica and dry with a rag. If vinegar is very strong, and is left on the mica too long, it will tend to eat right through it. Do not turn the wick too high at first. This causes fifty per cent of the troubles with lamps catching fire. All flames will work up as the burner and oil get warm, and if the flame is set at what one considers the right height, in less than half an hour it will be at least one-eighth of an inch higher. It is better to make two or three trips of inspection to see that the flame is right than turn it too high and cause serious damage. Close care and attention are necessary."

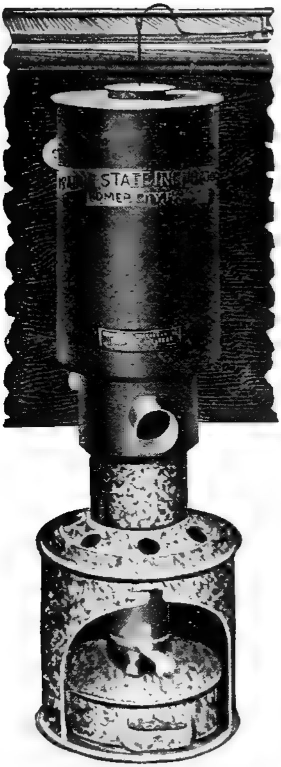
## WHY CHICKS DIE IN THE SHELL

Throughout the incubating season we get letters stating that the chicks die in the shell or that the machine fails to hatch, and questions are asked as to what is responsible for the trouble. If every condition were known, it would be possible to send back an intelligent answer; but if the operator knew enough about incubation to describe every condition, the chances are that enough of the art would be known to hatch the chicks with success.

There are many replies to the question as to what caused the trouble. The first thing to consider is the parent stock. Are they laying eggs that are capable of hatching strong, healthy chicks? If you are using eggs from pullets that have been forced for egg production throughout the winter, you can hardly expect either the incubator or the hen to hatch out a large percentage of strong, livable chicks. If the stock is in-bred, or too fat, or if the male is over or under mated, or if the stock is poorly fed, you cannot expect good results. The first thing is to be sure that you have strong, vigorous stock, that your eggs are coming from second-year or yearling hens, or from pullets that have laid during the fall and moulted in the winter and begun to lay in the spring.

The eggs may have been chilled by leaving them out of the incubator too long. They may have had too much or too little moisture. The ventilation may have been excessive or insufficient. The air may have been so damp that the air cell did not dry out sufficiently and the chick drowned in the excessive moisture. The atmosphere may have been so dry that the membrane became so dry and hard that the chicks could not break through it, or the chicks may have had insufficient moisture, which caused them to be very small, and in consequence, very weak. Many of these things happen under a hen and she fails to get out a good brood, but the number of eggs she fails to hatch does not seem so large as when several hundred go into the machine and more than half of them are left in the tray unhatched.

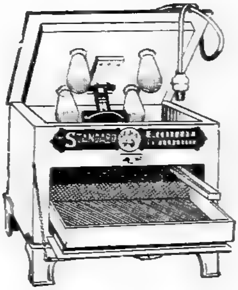
"The answers to this question are many, and must be indicated by the proportion of dead chicks to those hatched, and the stage of development and condition of the dead chicks. A chick may live up to the twenty-first day, or even twenty-third day, and still not be able to reach a successful exclusion; Because it lives so long is not taken alone as an indication that it was a strong germ, nor the fact that it had lived until the end of the period of incubation any proof that it was fully matured. It should be remembered that the pipping time, and thence to the complete exclusion of the chicken, is the most trying period in the life of the embryo. Up to this time the germ simply lies in quiescent state, but at the time of exclusion motion and force must be exerted to break the shell. At this critical time, if the chick is not fully matured or is lacking in vitality, it cannot successfully break the shell, and many are unable to exert force enough to even pip the shell, while others die in the different stages of exclusion. In such cases there is no possible remedy except to get germs of sufficient vitality and stamina and yolk food of the necessary properties to nourish them, in order to carry them through this critical period. An embryo chick fully or properly developed breaks the shell and leaves it as easily and clean as a well-ripened raspberry when plucked from the stem on which it grows. A strong, well-ripened embryo is ready for exclusion late on the nineteenth or by the beginning of the twentieth day, and ought to be out and dry by the beginning of the twenty-first. That is, if you have a good lot of eggs, they should begin to pip by the last part of the nineteenth day. Ducks should pip the latter end of the twenty-sixth day and clean up late on the twenty-seventh, or very early on the twenty-eighth. If they begin to hatch much before this time, they have had too much heat; and if much later, not enough. If they hatch on time and do not hatch well, the eggs and breeding stock are quite likely to be at fault. If they do not hatch on time, a good hatch need not be looked for, regardless of how good the eggs. A good hatch of hen eggs should be completed in ten hours; duck eggs in twenty hours."



This shows the Prairie State Lamp and Heater. One of the most vital parts of every hot air machine is its heater.

## DEATH IN THE SHELL DURING INCUBATION

The facts which cause high mortality of chicks in the shell during incubation are not very well understood. The greatest number of deaths, as a rule, take place on the 4th, 5th and 6th days, and again on the 18th, 19th and 20th days. It is said that 65 per cent of all the mortality in the shell occurs during these six days of incubation. The remaining 35 per cent of the mortality is distributed over a period of fourteen days of incubation. The critical periods appear to be exactly the same in the case of either artificial or natural incubation. The period of greatest mortality in either case coincide. It may be that the turning of the eggs on the third day has something to do with causing the high mortality on the 4th, 5th and 6th days. These facts, however, are yet to be definitely determined.



The Lo Glow Electric Incubator. If the electric current can be had at a reasonable rate, electric incubation is a clever and satisfactory method of operating small machines.

The percentage of deaths on the 18th, 19th and 20th days are much greater than during the first critical period. The greatest number of deaths occur about the 19th day, regardless of whether the eggs are incubated in a small incubator, a mammoth machine or under the mother hen. It will also be found that a large per cent of the embryos which die on the last days of incubation will be more or less deformed, having crooked backs, crooked toes, crooked necks, and so forth. The majority of these chicks would have been useless had they hatched. Many of the embryos will be found to have their heads at the wrong end of the egg, which is the small end.

In hatches which average 50 per cent of the total eggs set, approximately 40 per cent of the dead germs will die during the first two weeks of incubation and about 60 per cent will die during the last week of incubation.

The above facts being true, Prof. Loyal F. Payne of the Massachusetts Agricultural College has this to say as to a method of calculating the number of chicks to be expected from a hatch on the 14th day of incubation:

"This immediately suggests a method of calculating on the 14th day of the number of chicks to expect when the hatch is over. Example, 2,538 eggs incubated, 408 dead germs are found on the 7th and 14th day test. Therefore, if 408 equals 40 per cent, X equals 60 per cent, or the number of dead germs to expect the last week of incubation. The equation 408:40::x:60. The value of x plus 408 plus number infertile, plus number broken, subtracted from the total number set, will indicate the number of chicks expected. The percentages 40 and 60 are arbitrary and may vary as much as 5 per cent.

Our results indicate that the mortality the first two weeks are somewhat, although not accurately, an index to the mortality the last week. It is necessary to know something of the hatching quality of the eggs and the characteristics of the machine before any reliable value can be derived from the calculations.

This high mortality during the last period cannot be due wholly to the incubator, if we take the hen as a standard, since that is a critical period with hens as well as incubators. Certain important changes occur after the

16th day, regardless of methods, that possibly help to weaken less vigorous germs. First, the chick embryo's diet changes the 17th day. Before that it has been nourished principally by the albumen; after the 16th day the yolk is utilized. Second, the 19th day finds the embryo with a large part of the yolk unabsorbed, in the process of passing into the body cavity. In our work twenty per cent or more of the embryos that die occur on the 19th day. Third, the respiratory system completely changes about the 20th day. Until then, the allantois has functioned as the organ or system of respiration and excretion. When the beak of the embryo breaks through into the air cell at the large end of the egg, restricted pulmonary respiration is complete. These three changes may or may not be involved in causing high mortality. They are enumerated merely as possibilities.

**TABLE I.**

| Incubator | No. Set | Dead Germs | No. H'tc'd | Per Cent |
|---|---|---|---|---|
| Cyphers & Prairie State | 3476 | 1264 | 1747 | 50 |
| Candee | 1733 | 599 | 935 | 53 |
| Blue Hen | 1010 | 279 | 639 | 63 |
| Total | 6219 | 2142 | 3321 | |
| Per Cent | ...... | 34.4 | 53.4 | |

**TABLE IV.**

**Results of 268 Eggs Placed Under Ten Hens and in a Cyphers Incubator Set April 14.**

| | No. | Pct. | No. | Pct. |
|---|---|---|---|---|
| Eggs set | 130 | ..... | 138 | ..... |
| Infertile | 8 | 6.1 | 6 | 4.3 |
| Cracked | 19 | 13. | 0 | ..... |
| Dead Germs | 14 | 10.7 | 42 | 30.4 |
| Chicks Hatched | 91 | 70. | 89 | 64.4 |

In contrasting natural and artificial incubation, several interesting differences occur. Comparing two high periods of mortality, the cyphers (49 dead germs) and the hen (14 dead germs). The numbers are very small, but the following figures bring out a point well worth investigating. The per cent distribution of dead germs the 4th, 5th and 6th days was 16.1 (see chart) in the incubator and 35.6 per cent under the hens; the per cent of dead germs the 18th, 19th and 20th days was 56.9 for the incubator and 32.6 under the hens. These figures, with other data and observations, show the incubator is fully as good as the hen the first week of incubation, but is conspicuously inferior the last week. In other words, something happens in the incubator the last week or tens days which does not happen under the hen. Is it possible this something is inadequate and improper control of the ventilation and humidity, or perhaps the temperature? The trouble may be due to an unknown factor. Thermograph readings under a hen showed a variation of 6 degrees Faht. in 24 hours, and this variation correspondends with the atmospheric changes. The incubator temperature was constant. This variation in the temperature under the hen suggests free circulation of air. Other incidents lead us to believe low temperature is not the lethal factor, as noted in apparently normal hatches coming from hens that often leave the nest for hours, allowing the eggs to become cold, or from trays that remain out of the incubator several hours. Lamsoni reported that chick embryos from strong stock will stand from 4 to 5 hours exposure at 50 degrees F. after the first 24 hours of incubation. From this point on, the time may be increased up to 15 hours from the 10th to 12th day of incubation, but atfer the 17th day continued exposure at 50 degrees F. for more than six hours causes death to the embryos before the normal time for exclusion. Edwards gives the physiological zero, or the temperature below which there is no development of chick embryos in the first stages of incubation as 68 to 70 degrees F.

Slight changes in temperature or humidity provide favorable or unfavorable conditions for growth of micro-organism. Pernot attributes the cause of death in artificial incubation to baccilus 9. Therefore, it might be necessary to have a fine adjustment on temperature, ventilation and humidity "mix." Whatever the organism may be that destroys the embryo life in artificial incubation before exclusion, there seems to be one or more organisms present in eggs under hens which are not active in incubator eggs the first five or six days. That is, the contents of naturally incubated eggs, containing dead embryos, decompose much faster than similar eggs in machines. Few blood rings, but numerous "rotten" eggs are found under hens the 7th day of incubation, while blood rings are common and rotten eggs seldom found at that period in the incubator.

## TABLE II.

### Distribution of Dead Germs, **Number**

**DAYS**

| Incubator | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Cyphers & Prairie S. | 25 | 37 | 26 | 73 | 61 | 32 | 32 | 32 | 34 | 49 | 34 | 31 | 33 | 35 | 21 | 17 | 53 | 157 | 237 | 166 | 79 |
| Candee. . . ........ | 9 | 32 | 16 | 46 | 36 | 31 | 13 | 20 | 19 | 9 | 19 | 9 | 9 | 9 | 2 | 3 | 23 | 62 | 132 | 57 | 43 |
| Blue Hen. . ......... | 3 | 7 | 17 | 28 | 23 | 16 | 11 | 10 | 9 | 5 | 8 | 9 | 2 | 5 | 1 | 2 | 8 | 12 | 61 | 35 | 7 |
| Total. .......... | 37 | 76 | 59 | 147 | 120 | 79 | 56 | 62 | 62 | 63 | 61 | 49 | 44 | 49 | 24 | 22 | 84 | 231 | 430 | 258 | 129 |
| Per Cent. .... | 1.7 | 3.5 | 2.8 | 6.9 | 5.6 | 3.7 | 2.6 | 2.9 | 2,9 | 2.9 | 2.8 | 2.3 | 2.1 | 2.3 | 1.1 | 1.0 | 3.9 | 10.7 | 20. | 12. | 6.0 |
|  |  |  |  |  | 16.2 |  |  |  |  |  |  |  | 65% |  |  |  |  |  | 48.7 |  |  |

## TABLE III.

### Distribution of Dead Germs, **Per Cent**

| Incubator | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Cyphers & Prairie S. | 1.9 | 2.9 | 2.1 | 5.8 | 4.8 | 2.5 | 2.5 | 2.5 | 2.7 | 3.9 | 2.7 | 2.5 | 2.6 | 2.8 | 1.7 | 1.3 | 4.2 | 12.4 | 18.7 | 13.1 | 16.3 |
| Candee. . .......... | 1.5 | 5.3 | 2.6 | 7.6 | .6 | 5.2 | 2.1 | 3.3 | 3.1 | 1.5 | 3.1 | 1.5 | 1.5 | 1.5 | .3 | .5 | 3.8 | 10.3 | 22.0 | 9.5 | 7.1 |
| Blue Hen. . ...... | 1.1 | 2.5 | 6.1 | 1.0 | 8.2 | 5.7 | 3.9 | 3.6 | 3.2 | 1.7 | 2.9 | 3.2 | .7 | 1.8 | .4 | .7 | 2.9 | 4.3 | 21.8 | 12.5 | 2.5 |

## TABLE V.

### Distribution of Dead Germs From Hens and Incubator

**HEN**

| Days of incubation | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Number. . . ........ | .. | .. | .. | 1 | 3 | 2 | .. | .. | 1 | .. | .. | .. | .. | .. | .. | .. | 1 | 1 | 4 | 1 | .. |
| Per Cent. . . .. ... | .. | .. | .. | 7.1 | 21.3 | 14.2 | .. | .. | 7.1 | .. | .. | .. | .. | .. | .. | .. | 7.1 | 7.1 | 28.4 | 7.1 | .. |
| Per Cent of Eggs Set. | .. | .. | .. | .8 | 2.3 | 1.5 | .. | .. | .8 | .. | .. | .. | .. | .. | .. | .. | .8 | .8 | 3.1 | .8 | .. |

**INCUBATOR**

| Days of incubation | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Number.** . . ........ | .. | 2 | .. | 4 | 5 | 2 | .. | .. | .. | .. | 1 | 1 | .. | 1 | .. | 1 | .. | 1 | 16 | 7 | 1 |
| **Per Cent.** . ........ | .. | 4.7 | .. | 9.4 | 11.9 | 4.7 | .. | .. | .. | .. | 2.3 | 2.3 | .. | 2.3 | .. | 2.3 | .. | 2.3 | 38. | 16.6 | 2.3 |
| **Per Cent of Eggs Set** | .. | 1.4 | .. | 2.9 | 3.6 | 1.4 | .. | .. |  | .. | 7* | 7* | .. | .7* | .. | .7* | .. | .7* | 11.5 | 5.1 | .7 |

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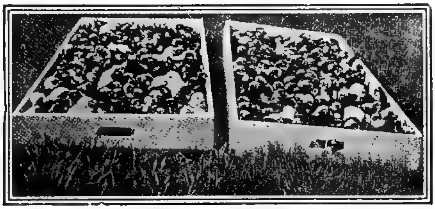
*** Indicates plus.**

## CAUSES OF POOR HATCHES

The cause of poor hatches is a much-discussed question, which, the Government says, depends on a great variety of circumstances. "A poor hatch is more apt to be due to the condition of the eggs previous to hatching than to incubation, although improper handling of either factor will produce the same results. When eggs fail to hatch, see whether the breeding stock is kept under conditions which tend to produce strong, fertile germs in the eggs, if the eggs have been handled properly before incubation, and whether the conditions were right during incubation, as judged by the time of the hatch."



Two trays of baby chicks have just been taken from a machine. You can see by the number of chicks in each tray that this was a good hatch, and that the chicks are full of pep and are the kind that will live and do well. Usually where the chicks are slow in hatching, where there are a great many infertile eggs and deaths in the shell, you will find, also, that there are a great many deaths from such a hatch after the chicks are placed in the brooders.

Between the eighteenth and twentieth days of incubation the moisture increases in an extraordinary manner. The temperature is also naturally inclined to go up. With human beings great warmth and great moisture produce heart attacks, pneumonia, and cerebral apoplexy.

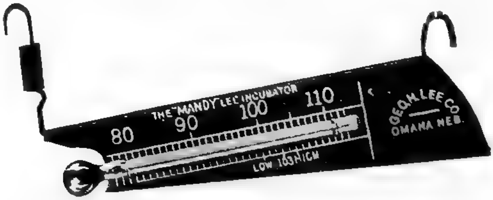
All chickens which remain dead in the shell die chiefly from apoplexy. When good sitting eggs are desired, the hens must not be overfed. From youth on, the fowls must have barely sufficient food, and when an abundance of succulent green food is obtainable, the flesh food should be discontinued to at least a limited degree.

## TEMPERATURE—TESTING THE THERMOMETER

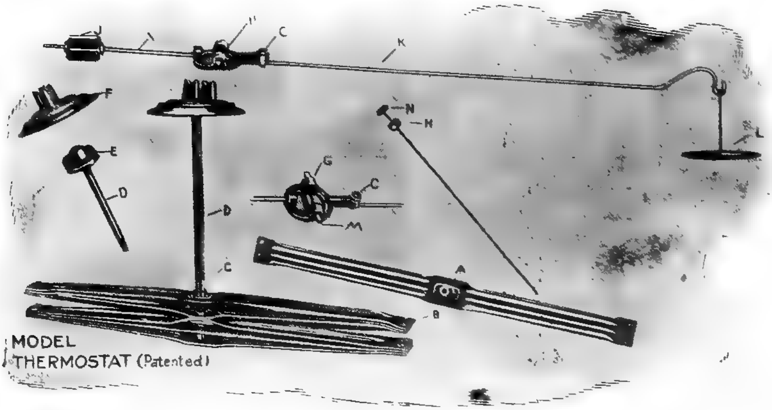
Since the maintenance of a uniform and proper temperature is of vital importance, and since we must depend entirely upon the thermometer to tell us when the temperature is right or wrong, it is of absolute importance that the thermometer **tell the truth.** New thermometers should be tested before being used, and old ones at the beginning of each season. The principal reason for the variation in thermometers is that the glass bulb and tube which contains the mercury tends to contract more or less after the mercury has been put in. Before testing a thermometer, make sure that the column of mercury is well settled, or it will register too high. To settle the mercury column, take the thermometer in the hand, bulb end down, and throw the hand downward with a sudden jerk, until the mercury is solidly connected. In testing your thermometer, secure a thermometer that you **know** registers correctly between 100 and 105 degrees. A phycician's clinical thermometer is best for this purpose. Then heat the water in a vessel until the thermometer which you know is correct registers about 105 degrees. Place the bulbs of the thermometers you are testing close to it, and move them gently to keep the water in motion. As the water cools down to 100 degrees, write down the difference in the readings of the two thermometers each time the correct thermometer drops one degree. In all future readings, allow for the variation thus shown.

## POSITION OF THE THERMOMETER

Manufacturers are by no means agreed as to the position of the thermometer in the incubator. Some place the thermometer with the bulb touching an egg. Others place the thermometer with the bulb, not in contact with an egg, but on a level with the tops of them. Still others suspend the thermometer about an inch above the egg. We prefer to have the thermometer suspended from the top of the incubator, and the center of the bulb on a level with the top of the eggs. Experienced operators are pretty generally agreed that the use of the thermometers with the bulk in contact with an egg is not the best plan, owing to the fact that there is considerable variation in temperature between an infertile egg, one which contains a weak germ, and one which contains a strong, vigorous germ. The best plan is to have the thermometer registering the temperature of the air on a level with the tops of the eggs. Where a thermometer is suspended with its bulb an inch above the eggs, it should read one degree higher than if on a level with the eggs.



Thermometer for an Incubator. Suspended from eyes in the top of the egg chamber Center of the bulb hangs just even with the top of the eggs.

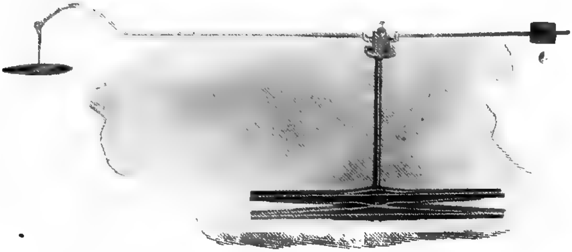


The Regulator and Thermostat. These are parts of the complete regulator. This illustrates clearly the corrugated bar of Thermostat shown above; also the complete quadruple leaf Thermostat.

## THE PROPER TEMPERATURE

Assuming that the thermometer registers the temperature of the air on a level with the tops of the eggs, the minimum temperature should be 102 degrees and the maximum 105 degrees. Numerous tests of the temperature of eggs under hens show the temperature to vary from 101 to 104 degrees, the average being approximately 103 degrees. Thus it will be seen that the nervousness which a great many amateur operators feel when the mercury goes a little above or a little below 103 degrees, is entirely uncalled for. Excellent hatches have been secured by running the temperature the first week at 102 degrees, the second week at 103 degrees, and the third week at 104 degrees, with the temperature running up to 105 degrees at hatching time. This gradual increase in temperature is due to the fact that as the germs develop they begin to generate animal heat of their own, the amount of heat increasing as the embyros grow and hatching time approaches.

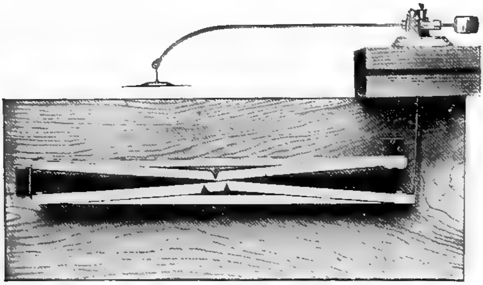
The germs are most delicate during the first week of incubation, and every effort should be made to maintain the proper temperature during that time. After the twelfth day, if by accident the temperature goes as high as 110 degrees or as low as 85 degrees, it will not necessarily spoil the hatch, if not too prolonged. If the eggs are found to be too hot, take them out and let them cool down to 100 degrees, allowing the incubator to stand open meanwhile.



The Compound Regulator of the Buffalo Incubator.

A uniform temperature of as nearly 60 degrees as possible has been found to be best for the room in which the incubator stands.

"With a correct thermometer hanging in the correct position and kept at a uniform temperature, the eggs may not have imparted to them the right number of heat units in twenty days, by reason of improper handling on the part of the operator."



Thermostat and Heat Regulator used on Buckeye Incubators.

"Thermal units," or heat units, are those by which heat is measured. A certain number of heat units are required before any chemical change can take place in a body of matter. Motive force is produced by heat units. Before the embyro can develop enough strength to free itself from the shell, it must absorb a certain number of heat units. If the chick is to hatch in twenty-one days, it must absorb just enough heat units to make this possible in that length of time. If the required heat units are not there to be absorbed, the hatch is prolonged beyond the correct period of incubation and the embyro is weakened and perhaps cannot develop life and power enough to exclude itself from the shell. If the temperature is kept too high, too many heat units are absorbed and the chick hatches too soon, or may be killed by the bad effects of the excessive heat units.

Some argue in favor of heating by radiation, diffusion or direct contact. No one method of heating an incubator has any special advantage over another unless by that method the control of the heat and the uniformity of heat is more easily obtained than by any other.

The insulation of the incubator walls is an important thing. With well insulated walls, the unequality of temperature in different portions of the egg chamber is reduced to the minimum. With light and poorly constructed walls and a cold incubator room, the intensity of the heat required to warm the eggs to the correct degree, is often strong enough to kill the germ floating at the top of the egg. With such incubators in such rooms, the temperature may be correct in the center of the egg chamber. and several degrees lower on the eggs near the walls. Also, where you are operating such incubators in a climate where the days are very hot and the nights fery cool, there is such a variation in the outside temperature that the incubator is affected by it and the eggs are first too hot and then too cold.

"A chick imperfectly ripened through lack of heat may look to be perfectly developed, but be too large and fill the shell almost completely, or it may not have had enough heat to allow it to even absorb the yolk. If over ripened from high heat in cold weather, it will be shrunken, and the membranes dried down hard around the chick. The effect of too many heat units in warm weather is to cook the embyro, and when the egg is broken the contents will be foul and watery, although there may still be life. When a chick does not exclude at the time it should, the membranes begin to shrink down around it, and it then has no chance to work its way out."

The Reed Electric Incubator made by the Liberty Manufacturing Co. No oil or lamps are required. They are fire proof and free from odors.

If the temperature has been kept up properly, the hatch should begin on the nineteenth or twentieth day. If the chicks should begin to hatch earlier, it indicates that too much heat has been supplied. If they are delayed beyond this period, the indications are that not enough heat has been afforded. Brown eggs take from one-half to a day longer to hatch than white shelled eggs, which have thinner shells.

## PERIOD OF INCUBATION

The period of incubation varies with different species of poultry, as shown in the accompanying table:

| Kind of Poultry | Days | Kind of Poultry | Days |
|---|---|---|---|
| Hen | 21 | Peafowl | 28 |
| Duck | 28 | Guinea | 26-28 |
| Duck (Muscovy) | 33-35 | Ostrich | 42 |
| Pheasant | 22-24 | Goose | 30-34 |
| Turkey | 28 | | |

These periods vary somewhat according to conditions. If the temperature has been kept too high, the hatch will come off in less time than the natural hatching period. If the temperature has been too low, the chicks may hatch several days later than the natural period. If your hatch is late in coming off and you have kept your temperature at 103 degrees, it would indicate that your thermometer is off and is registering too low. In that case, run it higher. Have your chicks hatch on the twentieth day and all off by the twenty-first, and you will usually get a good hatch, if other conditions are right and your eggs are fertile.

A hatch may be secured a day earlier or a day later than the required time, according to the heat maintained. In the case of chicken eggs, the best hatch and the best birds are secured when pipping begins late on the nineteenth or early on the twentieth day. This hatch should be well cleaned up early on the twenty-first day. Begin counting from the time the eggs are placed under the hen or in the machine. If the eggs are set on Monday evening, three weeks from that time they should be through hatching on Monday morning, eight or ten hours less than twenty-one days. If this can be done, you will get a better hatch, and the chicks will grow and develop faster and make better birds. The same principle applies to all other kinds of eggs.

## QUESTIONS ON INCUBATION

### Lesson No. 16

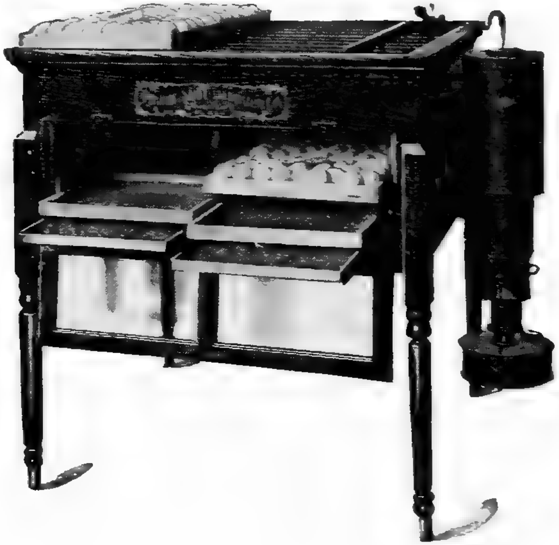
1. What can you say of the early history of artificial incubation?
2. What advantage has the artificial method over the natural method of incubation? What disadvantages?
3. What are some of the advantages of using hens for hatching? What are some of the disadvantages?
4. What kind of a room, shed, coop, house, or place would you recommend for sitting hens?
5. How many hens should be set at one time, and how would you manage them for best results?
6. What do you mean by artificial incubation?
7. What facts determine the size incubator you would buy?
8. What are some of the most essential features which every incubator room or building should possess?
9. Why should the incubator be perfectly level, and why should you test the machine before filling it with eggs?
10. At what period of incubation are the germs most delicate?

## HOT AIR OR HOT WATER MACHINES

The hot air machine has attained popularity in this country. In England the conditions are opposite.

Air heats and cools much more quickly than water. It is much cheaper to operate a hot air machine than it is a hot water machine. If the lamp flame of the hot water machine should go out, the heat will be retained much longer. The latent heat in the water would keep the egg chamber warm for some time.

The hot water tanks are much more likely to rust out or corrode and begin leaking. They are, for this reason, not so long lived as the hot air machine. They are more likely to get choked up with soot, which makes it difficult to get the machine to heat properly.

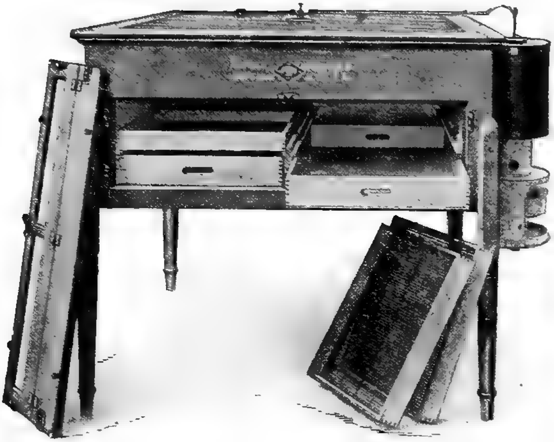


Prairie State Incubator. One egg tray in position, other on top of machine ready for eggs to be turned. The sand trays are shown beneath the egg tray.

In hot water tank incubators, the cold air enters and rises from below and is heated by radiation as it rises. The colder the weather the more rapid is the circulation of air through the egg chamber; the warmer the weather the lower is the circulation.

The fact that it is easier to retain the hot water heat does not make it necessary to have an incubator so well insulated in order to hold in the heat. For this reason the hot air machines of the best types are more expensive. The walls must be made so that they will readily retain the heat. It is true that there are also cheap hot air machines, but the more expensive machines do not have the hot water system of heat. Cheap machines will hatch chickens, but, just like a cheap watch, a cheap automobile, or any other piece of machinery that is cheap, it simply does not give satisfaction, but in proportion to the money paid you may get good results. However, we believe in putting your money into something that has maximum efficiency.

In a hot air machine it is easier to regulate the temperature. The air is heated by the lamp, but in the hot water machine the heat must be imparted to the water, and the eggs are then heated by the heat that comes from the heated water. This consumes more time and it takes longer to get the hot water machine heated up for running. The hot water tank is likely to wear or rust out in two or three years, unless it is made of copper and built properly. A thin copper or tin tank will not last very long. If hard water is used, there is an accumulation of sediment on the bottom of the tank, and they are very diffcult to get clean. This causes uneven radiation and varying degrees of heat are supplied in the various parts of the machine. We believe that the hot air type is the safest machine for you to buy as far as lasting qualities are concerned if you are using machines heated by lamps and of less than 500-egg capacity. Hot water machines are cheaper in price, and there are many of them that will give excellent results if they are properly operated and cared for. Most of the mammoth incubators are heated by coal burners and hot water circulating through iron pipes. There is no chance of these corroding and rusting out, as there is in the case of the small lamp heated hot water machines with tin, galvanized, or copper tanks.

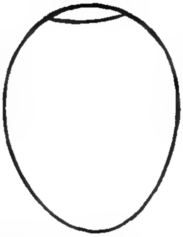


Latest Pattern Standard Cyphers Incubator, 390-egg capacity, showing the sectional door removed; left-hand egg trays and nursery drawer are in position; right-hand nursery drawer is partly drawn out, and egg trays from right-hand side are removed. On account of its larger egg capacity, the Incubator is equipped with four egg trays, as shown in illustration, thus allowing them to be handled with greater ease and safety.

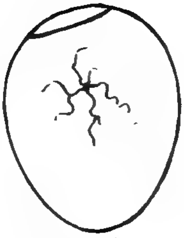
## THE SHELL AND EVAPORATION

The shell of an egg is composed of prismatic particles that are arranged in such a way as to leave pores between them. When the egg is first laid, it is of enormous strength when the thinness of the shell is taken into consideration. It takes a man of good strength in the hand to be able to crush an egg placed between the palms of the hands, placed so that the ends rest on the palms.

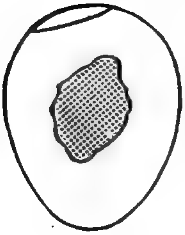
As the hatching proceeds the carbonic acid or carbon dioxide which is formed by the developing chicks is given off, and the prismatic particles are slowly disintegrated and softened. As hatching time approaches the shell becomes more brittle. They are very easy to fracture at this period. If the broken particles are placed under the miscroscope, it will be seen that the general appearance of the shells is very different. If this were not the case, it would not be possible for the chick, which is twisted up in the shell with little strength and little room in which to work, to ever extricate itself from the shell. This is a wonderful provision of Nature.



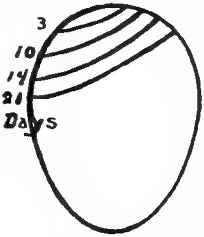
Fresh egg



Egg at 7 days



Dead germ

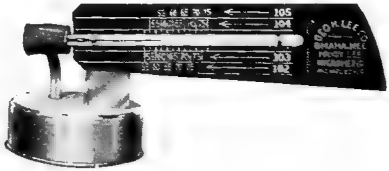


Development of air cell

## THE HYGROMETER

The hygrometer has been invented to be used for testing the evaporation. The hygrometer is not practical for general use and the air space test is the easiest and the best for the average operator. It would be well to set a hen at the same time that you set the incubator and practice by comparing the air space of the hen's eggs with those in the machine. Often-times moisture will be needed, and by constant observation you will soon learn when to add moisture. The probabilities are that there are more bad hatches from lack of moisture than from too much. Very often a number of machines are run in one cellar, which dries out the air very fast, and all of the air supplied the growing chicks has been dried of its moisture, and in such cases, because of the fumes from many machines and the lack of ventilation, the air is stifling. The most important period to supply the moisture is four or five days before the hatch.

In speaking of hygrometers, Chas. A. Cyphers, an incubator authority, says:

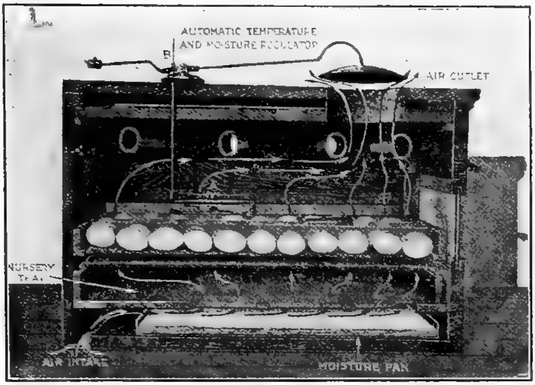


A Hygrometer. Webster defines the word as follows: "An instrument for measuring the degrees of moisture of the atmosphere." There are several other makes besides the one illustrated.

"The wet-bulb hygrometer is most untrustworthy when used under the conditions prevailing in an incubator.

"Some try to go by the size of the air-cell. The size of the air-cell is largely controlled by the rate of development of the embyro, which in turn is controlled by the heat treatment. It develops late and as a guide has no value.

"That brings us back to the original element, heat, and that must be controlled within most narrow limits. **Heat is the one great factor,** and is under the control of the operator in a properly designed and well constructed incubator. If he studies heat treatment, and learns to balance up the heat, with the cooling the eggs get under his handling, so that the eggs absorb the requisite number of heat units, and no more, within the alloted time for incubation, he will be pretty sure to get the best hatch possible according to the quality of eggs and incubator."

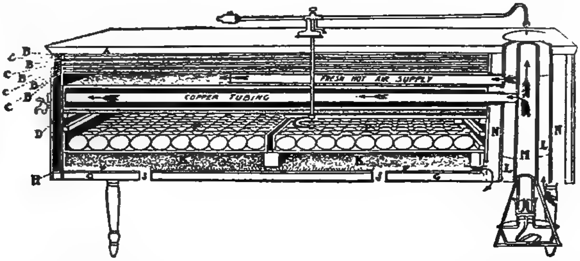


Cross-section view of compartment, showing ventilating system—Automatic Air, Temperature and Moisture Regulator, as used on the Newton Giant Incubators.

## THE AIR-CELL

We believe that Mr. Cyphers is right, but if there is any best way to ascertain whether the developing chick needs more or less moisture, it is by observing the air-cell. The evaporation of the moisture within the shell is constantly going on, which increases the size of this space. This air space is necessary, and should it, at the end of the incubating period, be very small, it would indicate that too much moisture has been supplied. The chick has no room for breaking the shell and the egg is so full of moisture that it either drowns in the shell or, if it manages to get out, it is covered with slime. When the egg is first placed in the machine, the air space is about an eighth of an inch; on the third day it will be about one-fourth of an inch; on the eighth day it will have increased to about three-eighths; on the fifteenth day it will be about five-eighths of an inch, and on the nineteenth it will be about three-quarters of an inch. The air penetrates the shell and takes the place of the evaporating liquid.

The Cyphers Incubator Company's directions have the following to say of the proper size of an air-cell: "We mistrust any directions which pretend to give the exact proportion necessary or even desirable in the air-cells of eggs during incubation. There are many conditions entering into the question, and good hatches are had from eggs which vary so widely in this respect that we are adverse to giving any definite size as being altogether requisite or necessary. Much more depends upon the strength of the germ than upon any particular size of the air-cell. Naturally the contents of the air adapts itself to the necessary conditions which go to insure good hatching results. When the natural vigor and stamina are weak, no mechanical art can by any possibility infuse the vitality which is lacking; and though the air-cell may be made larger or smaller and its size varied by mechanical means, the results will be the same and no good hatch be induced by this arbitrary method. In short, it is better to avoid all unnecessary fussing with the eggs; rather give the time to overseeing the conditions under which the breeding stock is kept, and give them all the intelligent care possible to the end, because of abundant exercise and proper food, the germs in the eggs may be full of health and life when this end is reached. Practically no attention need be given to the size of the air-cell during the process of incubation. Nature will furnish the means necessary to the desired end, and good hatching will be the rule rather than the exception."



Sectional view of the Reliable Hot Water Incubator, showing the construction of this machine. A—Outside top, or, cover, seven-eighths-inch lumber. B—Five layers of heavy cardboard. C—Four double layers of insulator. D—Hanging perforated fire-proof walls. F—Removable inner floor. G—Outside bottom floor. H—Insulator between double walls. I—Ventilation holes. K—Nursery beneath egg tray. L—Source of fresh hot air supply. M—Heat flue. N—Space between outer wall of heater, which takes in hot air which passes into the tube marked "Fresh Hot Air Supply." P—Egg chamber.

## HATCHING IN HIGH ALTITUDES

In high altitudes, a Tycos hygrometer which registers at least 10 degrees at 103 degrees temperature, sea level, will not register at all at 103 degrees of heat, 8,000 feet above sea level.

A great deal of added moisture is therefore necessary in any incubator in high altitudes. In general, it requires at least two quarts of water a day in any 200- to 400-egg incubator. But even with that amount of added moisture eggs will not hatch well. Instead, they are far more likely to have dried up, and, just as in ordinary cooking more time is required to produce a given result at a certain temperature, so in hatching with the twenty-one days remaining a fixed point, a higher temperature than 103 degrees is required to give results in the time limit.

Roughly stated, the problem is about as follows:

To hatch in twenty-one days, eggs require a higher temperature than 103 degrees, but each degree of higher temperature in a small lamp machine means greater ventilation, and greater ventilation means greater evaporation, and that in a locality in which great evaporation is one of the chief stumbling blocks. Again, the greater amount of added water the greater the evaporation, and the rapid evaporation of water is one of the quickest ways of lowering temperature. We have, then, a sort of a "ring-around-a-rosy" problem which seems endless.

In reality, once the theory of the problem is understood, it becomes a technical question to be worked out in detail by successive hatches. The general plan followed is to start the eggs at 104 degrees for the first two days, and to spray the inside of the incubator, though not the eggs, with slightly more than one pint of water at noon each day, the lamp being filled and trimmed previously each morning. After the second day, when the eggs are turned twice each day, the temperature is allowed to go up to 105 degrees and the amount of water increased till by the end of the week the amount of water is about one and one-half quarts. With this amount of water the hygrometer will average around 45 to 48 degrees.

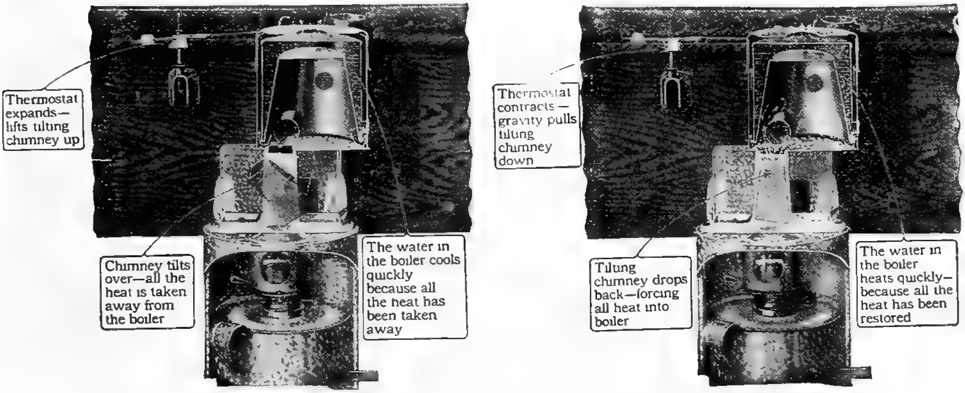
The bottom of the machine should be covered with two layers of woolen cloth or felt to help retain heat and moisture. For the first two weeks both felts are left in, and, as during the spraying they become quite soaked with water, they greatly reduce the ventilation through most of the day. During the last week the temperature is allowed to go up to 106 degrees and the spraying done twice a day, one quart of water being used each time. Throughout the hatch, the cement or dirt floor, if such is used, should be soaked by pouring pail after pail of water on it as often as it dries off. This course has to be kept up until the eggs begin to pip, at which time, and as often thereafter as your judgment dictates, a cloth must be loosely wrung out of warm water and laid over the eggs until dry.

For the last week only one felt or cloth should be left in the machine. Eggs in high altitudes are sometimes several days longer in hatching.

### MOISTURE

No problem connected with the subject of incubation is more complex or less understood, than the moisture problem, as related to the artificial incubation of hens' eggs. The opinions of incubator manufacturers differ vastly regarding it. Scarcely two experienced operators can be found who are agreed on the subject. Hundreds of them can be found, however, who claim to have solved the problem, and who assert their convictions with great positiveness. These widely varying opinions are undoubtedly due to the fact that the amount of moisture needed in order to bring off a successful hatch depends upon conditions, and varies as greatly as do the opinions regarding it. In view of this fact, the operator must always make a careful study of the conditions under which his incubators are running, as well as to the requirements of developing chicks, and then fall back upon his own judgment and common sense as a "court of last resort."

We state that the nearer the hatch, the more oxygen needed, and some then ask why we recommend closing the ventilators at that time. By closing the ventilators we mean only those at the outlet and not the intake. At this time you must retain the moisture in your machine. If there is an abundance of fresh air in the incubator room, the closing down of the ventilators which control the outlet will in no way injure the hatch, but will retain the moisture which is needed at that time. If the ventilators on both the intake and outlet are open during the last days, no moisture will accumulate on the glass of the incubator door, which shows that there is a lack of moisture in the machine. The best hatches, as a rule, are those where at least a slight accumulation of moisture can be seen on the glass in the egg chamber. You must have an abundance of oxygen, but you must also prevent the eggs from drying out at hatching time.


Thermostat expands—lifts tilting chimney up
Chimney tilts over—all the heat is taken away from the boiler
The water in the boiler cools quickly because all the heat has been taken away
Thermostat contracts—gravity pulls tilting chimney down
Tilting chimney drops back—forcing all heat into boiler
The water in the boiler heats quickly—because all the heat has been restored

The 103 Degree Incubator has a special feature called the tilting chimney. This forces the heat into the boiler or on the outside and the temperature is controlled by this process.

### CONDITIONS WHICH AFFECT THE AMOUNT OF MOISTURE REQUIRED

Under natural conditions, Nature supplies the egg with all the moisture needed in order to produce a live, vigorous chick. The hen, if allowed to choose for herself, will almost invariably make her nest on the ground, where the eggs attract some moisture from the earth. The hen also gives off a small amount of moisture from her body. While she sits upon the eggs, the air can circulate around them but little, and there is small opportunity for the contents of the egg to evaporate. Such evaporation as is required for a normal hatch takes place very slowly while the hen is on the nest, and more rapidly when she is off, and the eggs are exposed to the air.

Professor Graham of the Ontario Experiment Station found that, even in natural incubation, vitality was affected by the way a hen was set. (See Ontario Bulletin 163, page 27). Out of one hundred eggs set, the number of chicks alive at the end of four weeks were:

| | |
|---|---|
| With hens sets on the ground | 52.2 per cent. |
| With hens set on straw in box | 43.4 per cent. |
| With hens set in ventilated nest | 39.1 per cent. |

Thus showing conclusively that the natural secretions and moisture from the hen's body, and moisture which in the first instance came from the ground, must be retained even in natural incubation to secure chicks that will live.

This was also proved in the use of incubators. Where a non-moisture incubator was used, run according to directions, without any applied moisture in the egg chamber, while the hatches were fairly good, the mortality was very high.

When artificial incubation is resorted to, the conditions are changed. The eggs are no longer on the bosom of "Mother Earth," and covered by the warm, moist body of the mother hen. They are placed in a dry, artificially heated box, commonly known as an "incubator," through which air is constantly circulating with greater or less rapidity, as suits the ideas of the man who made it. Under such circumstances, the situation is rare where the hatch cannot be improved by the supplying of a greater amount of moisture in the egg chamber than will get there in the natural course of events.

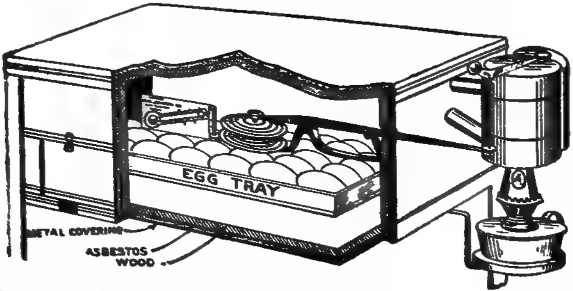
In general it may be said that the amount of moisture which will be required to sufficiencly check the evaporation of the contents of the eggs in the incubator depends:

(1) Upon the temperature of the air in the egg chamber. The warmer the air the greater will be the evaporation, and vice versa.

(2) Upon the rapidity with which the air is passing through the machine. The faster it moves the greater will be the evaporation, and vice versa.

(3) Upon the proportion of moisture which the air holds when it enters the incubator. If the air is dry as it enters the machine the amount of evaporation through the porous shells of the egg will be much greater than it will be if the air is already laden with moisture.

In view of these facts, it will be readily apparent that the amount of moisture which should be supplied will naturally be much less if the incubator is being run in a damp cellar than if run in a dry room in which there is a stove, or a dry basement in which there is a furnace. It will be less in the spring, when the weather is inclined to be damp, than it will be in the hot, dry spells of summer. The amount of moisture which should be supplied will be considerably less in damp climates than in the hot dry regions of Arizona and New Mexico, and so on. Thus one must be continually on the lookout, and studying daily conditions, as well as the pecularities of the particular make of machine which he has. Under some



An Old Trusty Incubator with a portion cut away to show the construction of the incubator and the location of the various parts.

conditions it will be necessary for you to supply extra moisture, and under others it will not be necessary. So you are again called upon to use your own good common sense.

## HOW TO TELL WHETHER MORE, OR LESS, MOISTURE IS NEEDED

From the time an egg is laid until the chick is hatched there is continual evaporation of its contents. As the liquid contents of the egg slowly evaporate the air sac in the large end of the egg gradually enlarges. Thus we can judge as to the amount of evaporation which has taken place, by placing the egg before a tester and noting the size of the air sac.

To be able to know whether the air sac is as large as it ought to be, or too large, for the length of time that it has been incubated requires patience and practice. It is like learning to play a trombone—you have to "learn to do by doing."

Another way of judging as to the amount of evaporation is by weighing the eggs when they are placed in the incubator and again every five days up to and including the twentieth day, testing them on the same days and noting the size of the air sac. If at the same time you have hens sitting under normal conditions, it will be well worth your time to compare the size of the air sac of the hen eggs with those of the incubator eggs that have been incubated the same length of time. Taking the eggs from under the hens as your standard, if the air sacs in the incubator eggs are larger, the liquid contents are evaporating too rapidly, and moisture should at once be added. Conversely, if the air-cells in the incubator eggs are smaller, evaporation is not taking place rapidly enough, and steps should be taken to increase the movements of the air through the machine.

At the Utah Experiment Station it was found that the loss in weight of incubator eggs during the period of incubation was greater than with eggs under hens. With incubator eggs the average loss in weight in eighteen days was 18.4 per cent, while with eggs under hens the average loss was 15 per cent. It was impossible to supply moisture enough so that the loss in weight of incubator eggs was as slight as the loss in weight of eggs under hens. In the tests it was noted that while there was no appreciable difference in the percentage of loss in large and small eggs, or in the eggs of different breeds, there was a marked variation in the loss in eggs from different hens. This was undoubtedly due to the difference in the porousness of the shells. The apparent difference in the hatchability of the eggs was so slight that no definite conclusion could be drawn from these tests.

## EFFECTS OF ADDED MOISTURE

Incubators set March 23rd.

Tests made to determine value of moisture:

| | | | |
|---|---|---|---|
| | No. 2<br>Maximum Moisture | No. 4<br>No Moisture | No. 6<br>Medium Moisture |
| Percentage Hatch. ....... | 53 per cent | 39 per cent | 50 per cent |
| | No. 3<br>Maximum Moisture | No. 5<br>No Moisture | No. 7<br>Medium Moisture |
| Percentage Hatch. ....... | 73 per cent | 35 per cent | 50 per cent |
| | No. 11<br>Maximum Moisture | No. 10<br>No Moisture | No. 5<br>Medium Moisture |
| Percentage Hatch. ....... | 75 per cent | 35 per cent | 58 per cent |

These tests, which were very extensive, containing many more records than we submit, indicate that proper germ development cannot take place where the proper conditions of humidity do not exist. More eggs were tested out as infertile or with dead germs in the dry machines than out of the moisture machines.

Weighings were made of the eggs every six days. It was found that the loss by evaporation was about 25 per cent greater in incubators than under hens. These machines were run without moisture. This evaporation is due to the dryness of the atmosphere in the incubators. The drier the air the more quickly will the moisture be taken from the eggs. The greater the moisture put in the machine the less the loss in weight.

It was found that the loss in evaporation was 16.13 per cent, as against an average of 12.28 per cent when the sand trays were used. This is no doubt the most effective way to supply moisture.

In this discussion please bear in mind that this experimental work was done in Utah, where the atmosphere is drier than in many other sections of our country, and due allowance must be made for that fact.

The general atmospheric conditions must be taken into consideration when you consider the moisture problem. These tests were made in Utah and would not apply to all sections.

The Prairie State Incubator Company has the following to say with reference to moisture: "Moisture is very essential in securing well developed and hardy chicks. The galvanized pan should be filled with sand from one-half to three-fourths of an inch in depth and kept soaking wet so that puddles of water can be seen in the low places. This wet sand is used the entire time of incubation from start to finish. The sand should not be allowed to become dry at any period of the hatch, for the reason that as the sand dries out, the temperature will rise; so that when the sand is constantly wet the evaporation will not affect the regulation of the heat, but where the sand is allowed to become alternately dry and wet it interferes with the maintaining of the uniform temperature on the eggs." If sand is used in these trays, be sure to use a quality of sand that will not mold or does not contain dirt and certain chemicals which are injurious to the hatch. We prefer trays or pans of water, unless you can obtain clean, pure sand. We have experienced much trouble with some grades of sand that contained soil and dirt.

In speaking upon the subject of moisture, Mr. L. E. Keyser says: "The fact that there is sufficient moisture in the egg to meet all the natural requirements of normal incubation, if this moisture is not dissipated, has led to the belief that if ventilation is by filtration, no supplied moisture will be required. Under certain conditions this has proven to be the case. Eggs hatch about as well without moisture as with it, but as a general thing the no-moisture chicks do not seem to be as strong. A movement of air, no matter how slight, through and between the eggs has a drying effect, and is also unnatural. We cannot expect to ventilate an incubator holding 200 or 300 eggs in the same manner as we do a hen's nest holding 13 to 15 eggs. The eggs in the center will not get sufficient oxygen unless a large body of air is passed through the machine, and as, in many cases, much of the oxygen has been burned out of the air by passing it through a heater, a still larger quantity is required."

If sand trays or water pans are used, care should be taken that they are not placed where they will shut off the bottom ventilation.

If the incubator room has a concrete floor and the general atmospheric condition is quite dry, we take a hose and turn the water on the floor until it is thoroughly wet; or, we will take a large sprinkling can and thoroughly sprinkle the floor each night and morning. In such a room it dries out slowly, and enough moisture is supplied for good results without applying it directly to eggs in the incubator chamber. In ordinary weather, when the ground and the atmosphere contain a reasonable amount of moisture, it is not necessary to supply an additional amount, as a rule. We have never found it necessary to add moisture to the machine in rainy seasons or when the air was laden with moisture.

It is just as important, and in some cases more so, to have moisture in the air in your incubator room than to have it inside of the machine. If the air in the room contains considerable moisture there is not so much danger from the lack of moisture in the egg chamber. That is why we recommend sprinkling the floor once or twice a day, if you have a concrete floor, or keeping moist sand beneath the incubators.

## DRYING DOWN EGGS

If too much moisture is used and the contents of the egg are not properly dried down, the chick will be so large that it cannot turn in the egg and free itself at hatching time.

People do not seem to realize that an egg contains excess moisture, which must be gotten rid of if a good healthy chick is to result. If the water is not gotten rid of, it enters into the body of the chick, making a large, weak, flabby chick, which, even if it does hatch, will never do well, and at the same time reduces the size of the air-cell, and consequently the breathing capacity of the embryo.

The manager of a big poultry ranch in California stated that he frequently analyzed the eggs from his breeding stock by evaporating the egg contents down to a dry ash and comparing the final solid contents with the original weight of the total egg contents. This naturally gave the proportion of solid content and watery content, and he found that the eggs with the largest proportion of solid content invariably gave the best hatches and the strongest chicks.

Of course, this leads to the conclusion that the eggs carrying an excess of water can be made equally as strong if the excess water is evaporated, which will bring a proper proportion of solid contents.

Examine the air-cells in several eggs at different periods of incubation and govern your moisture accordingly. Set a hen at the same time you set your machine and compare the air-cells of the incubator eggs with those of the hen hatched and note the difference. Test them at different periods during the hatch and you will soon become adept in controlling the moisture.

## RELATION OF HEAT TO MOISTURE

"I have found that heat bears a definite relation to moisture; this thought came to me when observing the numerous heat prostrations in the East, with heat at 90 degrees and moisture at 65 per cent or 70 per cent, while no prostrations occurred in Arizona with heat at 105 degrees and moisture at 20 per cent to 30 per cent."

After many months of experiment on the above proposition, Geo. H. Lee says: "I decided that heat and moisture have definite relations. **High heat must have low moisture. Low heat must have high moisture.** High heat, combined with high moisture, is one thing that kills most hatches, and low heat combined with low moisture is another. With high heat one must have low moisture and more air movement, to avoid **heat prostrations,** and this fact is the same with chicks in the shell as with human beings in a 'sunstroke' climate." Moisture should never be supplied unless needed, and it is better to have both heat and moisture a little below rather than much too high.

We think Mr. Lee's advice applies more especially to the last few days of incubation. When the chick's lungs become active, his advice is certainly applicable.

## CARBON DIOXIDE IN INCUBATORS AND UNDER HENS

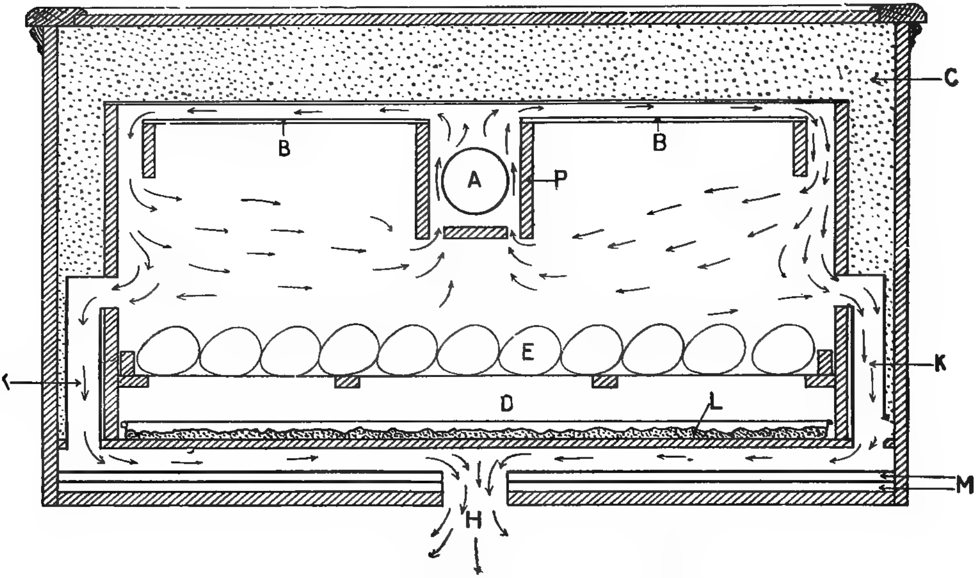
It has been argued that carbonic acid gas (carbon dioxide), due to improper ventilation of incubators, is a common cause of chicks dying in the shell. The average of a large number of tests made at the Utah Experiment Station showed that in each 10,000 parts of air drawn from incubators there are 20.68 parts of carbonic acid gas, while in the same amount of air drawn from under hens there were 43.63 parts of carbonic acid gas, or more than twice as much. Yet the hatches from under hens were slightly better.

Further investigations and tests showed that carbonic acid gas, when moisture was present, has a decidedly decomposing effect upon the egg-shells, thus helping to release the chicks. The results of these tests lead to the conclusion that when chicks die in the shell, it is not because of excessive amounts of carbonic acid gas. But, on the contrary, death in the shell may sometimes be due to the lack of sufficient carbonic acid gas to decompose the shells.

Tests were made to compare the carbon dioxide under the hen and that in the incubator. The experiments indicated that the hen gives off a great deal of carbon dioxide from her body. It was proved that the growing ebryo gives off much carbon dioxide, and is the chief source of carbonic acid gas in artificial incubation.

In regard to the effect of carbon dioxide, odors from incubator lamps, and proper ventilation in incubator rooms, J. L. Nix, one of our best incubator experts, has this to say:

"Professor George H. Lampson, Jr., of the Connecticut State Agricultural College, has recently determined, by the use of specially constructed apparatus, the exact amount of ventilation required in an incubator for the best results, as well as the effect of carbon dioxide in incubation. His experiments have been continued for over five years, have been very accurately and carefully made, and we believe the subject is settled once and for all with regard to the matter of ventilation. The best results were secured where the air change amounted to five cubic feet per hour for each 50 eggs. Where the ventilation exceeded 10 cubic fet per hour, the hatch began to run down; and where the ventilation was reduced to one-fourth of a cubic foot per hour, only a very small percentage of chicks were hatched. The embryo breathes through the shell until exclusion time. Experience and science now both tell us the great necessity of ventilation in securing healthy, hardy chicks. Carbon dioxide is not a factor in incubation until it is in excess, when the proportion in an incubator does not exceed the amount found in natural incubation. It has no influence upon the hatch one way or another, except when present in a high degree. When higher than in natural incubation, it indicates insufficient ventilation. Not only must the incubator be ventilated, but the ventilating current must not be contaminated by leaky heaters or bad air in the room where the incubator stands. The embryos are particularly susceptible to gaseous or vapor influence.



Prairie State Eddy-Current Distributor and System of Ventilation. A—Inlet pipe from heater, which discharges air into box or inclosure, P. B—Metal radiators in top of egg chamber. C—Cotton batting filling between inside and outside cases. D—Nursery.

E—Eggs. H—Discharge outlet of the ventilating current in bottom of incubator.

"Professor Elford, at McDonald College, found that the vapor of kerosene oil from an ordinary tank in the hatch room reduced the hatch 17 per cent. In a room having no ventilation, only 11.9 per cent of the eggs hatched; of these 55½ per cent died the first week. In a well ventilated room, 36.3 per cent hatched, and only nine per cent died the first week; the difference being in the first case 5 1-3 chicks to 30. This shows the influence of bad air outside of the incubator, a trouble easily avoided by free ventilation.

"Put large suction ventilators in the incubator room. The room should be ventilated until the odor from the lamps is not apparent."

## OXYGEN AND VENTILATION

The growing embryo must be supplied with oxygen during the period of incubation. But it is possible to supply more air than is necessary, especially during the first half of the incubation period. This is especially true if the temperature in the machine should run too high.

Too little oxygen causes too rapid development of the heart, and the heart is forced to beat so rapidly in order to supply the embryo with sufficient oxygen that it results in hemorrhage, which is shown by blood rings in eggs where the germ has died.

During the second week the chick needs a large amount of blood, which calls for a large supply of oxygen. The third week there is a call for still more oxygen, for large quantities are needed, as there are many wastes of which the system must be rid. We mention these things not with a view of giving you set rules, for this cannot be done; but we wish rather, to call your attention to facts and must depend upon your judgment for the proper application of general principles.

As a rule, the operator does not need concern himself very much about the ventilation of the incubator itself, providing the incubator room is properly ventilated. There is no registering instrument for the operator to go by, and, if the incubator is not so constituted that it will properly take care of this element, then that machine is hopeless from the start. Therefore, you cannot afford to experiment and waste eggs and valuable time on a cheap or untried machine. Buy one which is giving general satisfaction in the hands of even amateurs, and you will show good judgment and will be on the safe side.

## OXYGEN A BIG FACTOR

In all animate creation, blood is the life giving element. Health and strength can only exist where the quality of the blood is good. Weakness and disease thrive best where the quality of the blood is poor. Good blood is distinguished from poor blood by the possession of rich, red corpuscles, as compared with a lack of those corpuscles in the blood which is described as being poor or aenemic. The process by which Nature provides the red blood found in the animal possessing vigor and health is by its circulating through the lungs of the animal, and there coming in contact with the fresh air, or oxygen, which the animal takes into the lungs through the process of respiration. If the lung capacity is not filled constantly with the oxygen necessary to thoroughly aerate the blood in its circulation, then the blood becomes weakened in its quality, sluggish in its action, and the effect is at once apparent in the lessened vitality of the individual or animal, as the case may be.

Breeders who are able to secure only 40, 50, and 60 per cent hatches from eggs that are shown to be well fertilized, and in which development is shown to have gone on uninterruptedly to the very day when the chicks should be coming out, have been asking themselves the question, Why? This inquiry, I believe, is a proper one, and one that must be answered satisfactorily before artificial incubation can be spoken of and accepted as a problem fully solved.

The eggs begin to pip on the eighteenth, nineteenth, and twentieth days. The little bills begin to appear, and when at the expiration of the twenty-second day we find that not more than 60 per cent of live chicks appear, is it to be wondered at that we ask the question, Why? Why was it that the other 40 per cent of these mature chicks, many of which had pipped the shells, were unable to extricate themselves but died?

I again find myself considering a mind picture of that egg chamber, two feet square and six or eight inches in depth, containing less than four cubic feet of air space. I note the little chicks who have braved the ordeal with their faces to the light, panting away, scarcely able to breathe, and throwing out so plainly the warning signal of distress. As I think of how one hundred and twenty chicks have been confined in that space, in which all ventilators have been closed, breathing over and over again the carbon dioxide which has been thrown off by each of these little fellows for the period covered particularly by the eighteenth, nineteenth, twentieth, and twenty-first days of incubation, without a proper supply of oxygen with which to aerate the blood circulation and thereby provide the strength necessary to aid Nature in her processes of birth, the suggestion comes to my mind at once, "How was it possible for any of these chicks to hatch and live?"

And so I go over again in my mind the wonderful life giving properties of oxygen. I recall how medical science resorts to its use in pneumonia, and how it resuscitates and brings back to life those who have stood in the Valley of Death. I begin to feel that perhaps we have blundered; that we have been stumbling along in the darkness, and that by closing the ventilators we have denied to our little chicks in the incubator the very life giving property that is so essential for their successful and healthful advent into the world.

If the fresh air, open front house was the successful solution of providing healthy, vigorous breeding stock; if aeration of the blood through the supplying of oxygen spells health to mature fowls kept in large roomy quarters, how can we expect healthful conditions in little chicks that are compelled to spend the first four or five days of their lives in a compartment heated to 103 degrees, with nothing upon which to build but the carbon dioxide gases thrown off during the process of incubation? The New York State College of Agriculture, in a recent Buleltin, says: "Oxygen is essential to normal development, the amount increasing in the growth of the embryo. The eggs give off large quantities of carbon dioxide, and this increases as the embryo grows."

Oxygen means life; and I believe the time is not far distant when its value and beneficial effect as a life giving property will be recognized to such an extent as to demand the introduction of some appliance wheerby it may be supplied to little chicks during the last three days of incubation.

To my mind this is one of the most important problems confronting the poultrymen of the present day; and it is only by something being done along this particular line that we can ever hope for that success in incubation which is essential to success in the poultry business as a general proposition. Successful incubation does not mean 60 per cent live chicks and 40 per cent dead in the shell. It means that, if on the eighteenth day there are one hundred and twenty fully developed chicks in the egg chamber, on the twenty-third day there should be one hundred and twenty live, healthy, vigorous chicks in the nursery. Oxygen is necessary to the human system in order to provide health. It is an essential requirement for the breeding stock if it is to be healthy, vigorous and strong. Oxygen is ten times more important to the young chicks just coming into the world than to mature fowls; and, if we are ever to have successful incubation established as a fact, I believe it must come sooner or later along the lines of supplying a sufficient quantity of oxygen to little chicks during the last three or four days of incubation.

Few people seem to realize the importance of an abundance of air in the incubator room. Many students write us that they have their incubator down in a cellar or basement, and that they keep one small window open on one side of the basement and that they, therefore, know that the poor hatch was not due to lack of fresh air. They do not seem to realize that one small window open on one side of the room does not create a circulation. An abundance of oxygen is required by the chicks during incubation. Therefore, there must be an abundance of air and a perfect circulation in the room where the incubator is being operated. It is better even to have a slight draft rather than not to have sufficient ventilation, but not enough draft to interfere with the lamp or heat.

If it is possible to get an intake near the floor and an outlet in the ceiling of the incubator room, so that the air will pass on out through the roof and thus create a circulation in the incubator room, so much the better. We have seen hatches doubled where this method was used.

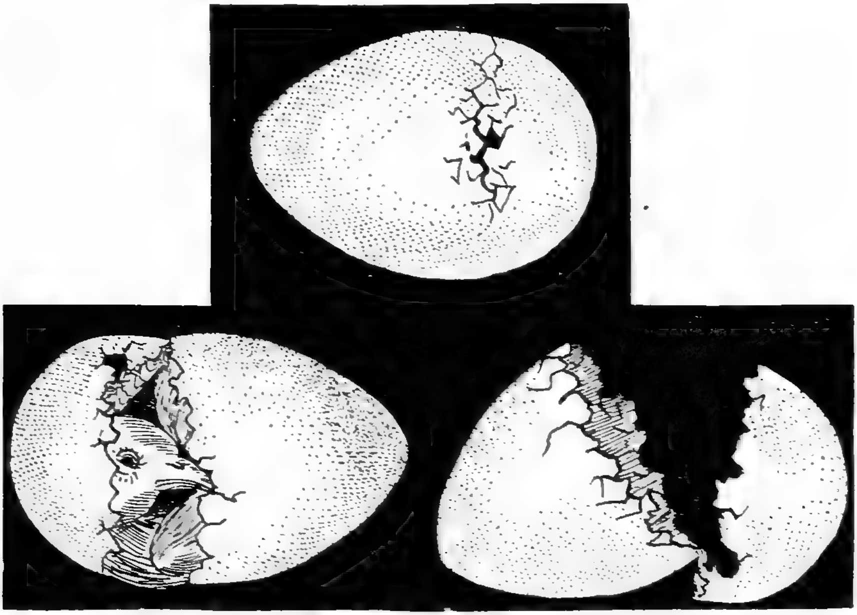
## THE MECHANICS OF INCUBATION

TURNING AND COOLING.—The usual method of procedure is to begin to turn the eggs for the first time on the morning of the third day, and to cool for the first time on the sixth or seventh day. This cooling and turning is continued until the end of the eighteenth day, at which time the doors and ventilators are closed, and not opened again until the close of the hatch.

It has been observed that sitting hens begin to turn their eggs within a few hours after they are placed under them, and that they do not wait seven days before leaving their nests for food; nor do they cease leaving their nests regularly until the chicks begin to hatch.

With these observations in mind, the Rhode Island Experiment Station broke away from the usual custom and, in a carefully conducted experiment with four incubators, turned the eggs for the first time about thirty-six hours after they were put in the machine, and slightly cooled them early on the third day. They were turned and cooled daily until the eighteenth day, when turning was discontinued. The cooling was continued in the usual manner until the first egg pipped, when the machines were closed until near the close of the hatch. The result was a better hatch than any of the machines had made in two years.

Some authorities claim that the oftener the eggs are turned the better the hatch. We prefer to turn night and morning from the third day of incubation to the eighteenth day.



Different stages in the escape of the chick from the shell. Drawing by Finch.

## WHY TURN EGGS AT ALL?

The twisted cords of chalazae furnish a hammock for the yolk of the egg. The blastoderm is always on top, and, when the egg is given a sudden twist, the yolk swings in the hammock and the developing germ remains on top of the yolk. The blastoderm is separated from the shell by the least motion. Unless the eggs are turned occasionally, there is danger of the yolk and germ sticking to the shell. The shell being porous, the tendency to adhesion increases. Turning also moves the embryo in the egg so that different positions are assumed by it. This lessens the chances for crippled and deformed chicks at hatching time.

We believe that you can reduce the number of deaths in the shell on the 4th, 5th, 6th and 7th days of incubation by being careful in turning the eggs at that time. When the embryo is just beginning to develop it is very frail and a sudden jar or rough handling of the eggs or egg tray is certain to cause a number of deaths. Instead of turning the eggs twice a day from the third to the seventh days of incubation, we would recommend turning them only once on these days and be very careful to see that the eggs are handled with absolute care. The percentage of deaths on the fourth, fifth, sixth and seventh days can be reduced if this method is pursued.

## WHEN TO QUIT TURNING

The eggs are not to be turned the last three days of the hatch—that is, the day before the eggs should pip, in order that the chicks may have better opportunity to get their heads up. When the turning has been discontinued in time, the first crack in the shell will appear on the top side of the egg.

It seldom pays to try to aid any of the chicks in getting out of the shell. Most of them will be cripples even if they get out. If many fail to get out of the shell, conditions are wrong somewhere and you had better investigate.

## DO NOT TURN EGGS AT HATCHING TIME

On about the eighteenth day of incubation the chick begins to get itself into a position to pick its way from the shell. On about the nineteenth and twentieth days you will notice that some eggs are pipped and the shell partially broken. If the eggs are turned after the chicks begin

Always see that your hands are thoroughly cleaned before you attempt to handle or turn the eggs in your machine. This shows the turning of the eggs with a circular motion of the hands. After a few of the eggs have been tested out of the trays, the eggs can be easily turned by hand, by simply moving them about in the tray, as is shown. It is not necessary to mark each egg and see that it is turned exactly half over at each turn.

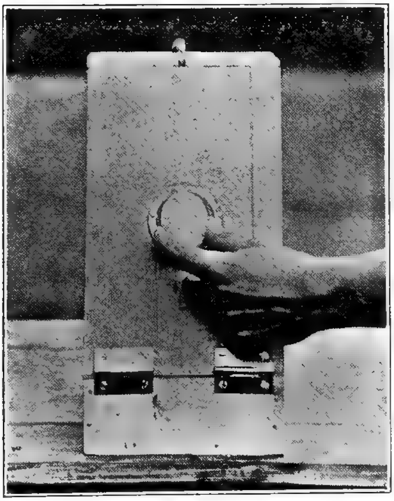
to work their way out, there is great danger that the chick will dry and stick to the shell if it is forced to turn over and start a new opening. Therefore, quit turning on the seventeenth or eighteenth day. Close the incubator door, watch the temperature, but do not disturb the chicks or eggs. If you do not get a good hatch, the fault lies with your breeding stock, the machine, or with your method of operating the same.

### HOW TO COOL

Remove the egg trays from the incubator and place them on top of the machine. Close the incubator door and allow the eggs to remain out until most of the animal heat appears to have left the eggs. The best way to test this is to close the eye and touch the sides of the egg to your eyelid. If the heat seems to have left the egg, and the shell feels cool to the eyelid, then place the eggs back in the incubator. It will require a longer time to cool eggs that have been incubated for two weeks than it will those that have been in incubation for only a few days. Cool once a day, and the best time is usually in the morning when the eggs are turned.

### HOW TO TURN

Place the egg tray on a table that can be moved from incubator to incubator, or place the trays on top of the incubator. It is not necessary to mark one side of the egg in order to see that each is turned exactly half over each time. Simply remove a few eggs from one end of the tray and then shuffle and move them about in the tray gently with both hands. Then replace the extra eggs at the opposite end of the tray. Turn night and morning, doing the cooling in the morning, and immediately replacing the eggs in the incubator when they are turned at night. It is advisable to reverse trays, and also reverse the ends of the trays each time they are replaced in the incubator, so if there is any variation in the temperature in the different parts of the incubator chamber, all eggs will come in contact with it and you will thus get a better and a more uniform hatch. Do not start turning the eggs until the third day and discontinue on the eighteenth day.



A Home-made Egg-Tester. The tester shown here has an electric light inside. If you use a kerosene lamp, be sure to bore a hole the size of the top of the lamp chimney, in the top of the tester. Courtesy of Purdue University.

### TESTING THE EGGS

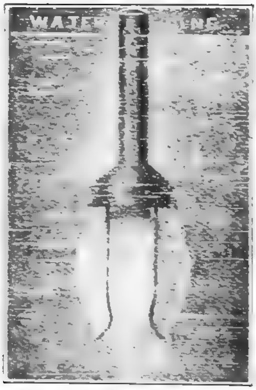
The eggs should be tested twice during each hatch, preferably on the seventh and fourteenth days. If the white shelled eggs are being used, the amateur will not experience much difficulty in distinguishing the fertile eggs, the infertile eggs, and the eggs which contain dead germs. Where brown shelled eggs are being incubated, it will be better for the beginner to wait until the tenth day before making the first test. The fertile eggs which contain strong living germs, when held before the tester on the seventh day, will show a small dark spot with irregular lines radiating out from it, giving it somewhat the appearance of a spider. These irregular lines are blood-vessels, and the small dark spot is the embryo chick.

Eggs containing dead germs are not so easily recognized, as they sometimes present varying appearances. As a general rule, however, an egg containing a dead germ will show a small red line adhering to the inside of the shell, or an irregular circle of red or brown containing a small dark spot which seems to be fastened to the inside of the shell.

An infertile egg will appear clear, or nearly so. If a strong light is being used a faint cloudliness may be discernable in the center of the egg—which is due to the yolk.

Testing will either have to be done at night, or in a darkened room, if in the day time. If the testing is done in a room where the temperature is much below 60 degrees, a blanket should be thrown over the eggs to conserve the heat. Place the large end of the egg into the hole in the tester, which should be about the size of a half dollar. If in doubt as to the condition of the contents of the egg, twirl it slowly with thumb and fingers, while before the tester, to give you a better view. The infertile eggs, tested out, may be hard-boiled and fed to growing or laying stock. Those containing dead germs should either be burned or buried. Eggs about which you are in doubt should be marked and special attention paid to them at the second testing. Thus you will become more and more proficient in testing.

The second test may be made on the fourteenth day. It is much easier than the first test. In fertile eggs, the air-cell will be considerably enlarged, and the lower portion of the egg will show very dark and opaque. Eggs containing germs that have died since the first test, or about which you were uncertain at the time of making the first test, will appear streaky and watery, and sometimes give off a foul odor, showing that the dead germs have begun to putrefy.

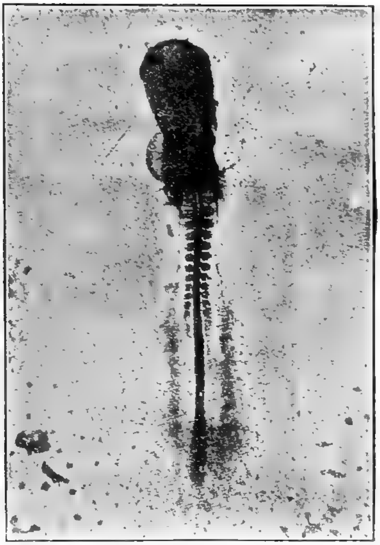


This shows an egg being submerged in water when tested by the Magic Egg Tester. The fact that this egg has gone down for some distance in the water shows that it is fresh and full of meat.

## THE MAGIC EGG-TESTER

By dropping eggs in water, those which are fullest and freshest will sink to the bottom. The stale egg or the egg which has evaporated and is light will, of course, float nearest the top. It does not take a device that sells at from one to four dollars to tell these facts. They can be told by simply placing the eggs in a vessel of water.

No device can tell the fertile from the non-fertile eggs before they are incubated. However, it is only reasonable that the eggs which are freshest, which are fullest of dry matter and freest from evaporation, will be the ones which will be most certain to hatch, and which will hatch the strongest chicks. If you have a large per cent of unhatchable eggs, it might pay to test them in water, and pick out those which float nearest the top.



Embryo chick about 28 hours after the beginning of incubation greatly magnified.

## THE DEVELOPMENT OF THE CHICK DURING INCUBATION

A great deal of valuable information relating to the subject of incubation can be secured by studying the development of the chick from the time incubation begins until the fully developed chick emerges from the shell.

White shelled eggs are best for this purpose, as the light penetrates them more easily. An ordinary egg-tester (such as is sent out with the various incubators) and a kerosene lamp may be used. The work will be more satisfactory, however, if a stronger light can be used, such as an electric light or an acetylene bicycle lamp.

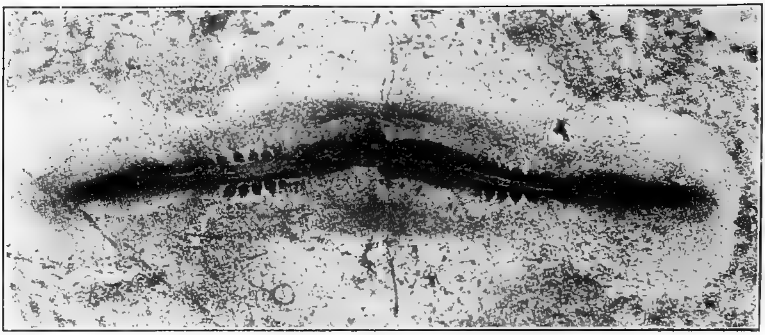
At the end of the first twenty-four hours of incubation a slight change can be detected, provided a white shelled egg and a very strong light are used. A small shadowy circle, about the size of a dime, showing a reddish or rosy tint, will be seen.

By the end of the second day the circle will have grown a little and will be darker in color.

By the end of the third day the development of the germ will be quite plainly visible. A network of fine blood-vessels will be seen radiating out in the circumference of the circle. If at this early stage of development the egg is carefully broken into a saucer, the heart of the embryo chick can be seen steadily pulsating for several minutes after the egg is broken. The lens of the eyes and the development of the nasal pits can be seen at the end of three days.

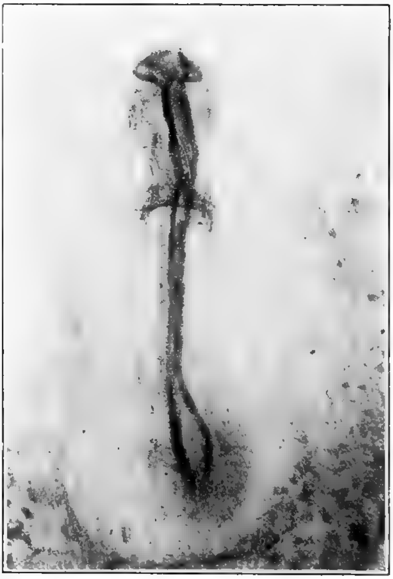
After four days of incubation, the outer circumference of blood-vessels will have still further enveloped the yolk, and will appear quite distinct. A spot in the center of the blood-vessels will be quite plainly visible. It is the shadow of the embryo chick.

About the only change that will be noted at the end of five days of incubation will be that the parts seen the day before will have continued to grow, and will show up much more distinctly. If watched closely for a few moments, the embryo will be seen to move, apparently swimming in the sac of transparent fluid which contains it.



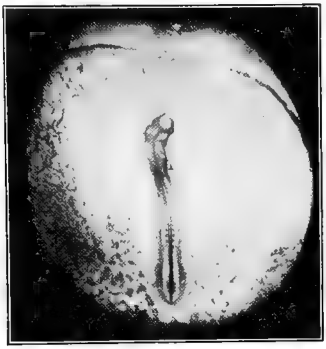
Twin embryo chicks from one egg about 25 hours after the beginning of incubation, greatly magnified.

By the end of the seventh day the network of blood-vessels should be well over the sides of the yolk and by the end of the eighth day, if development is progressing normally, the yolk should be entirely enveloped. These blood-vessels reach out to the shell membrane, and the shell and shell membranes, being porous, admit the air, and the blood-vessels carry the oxygen from the air and the food from the albumen to nourish the developing embryo. The embryo by this time should be very active, swimming about energetically in its watery sac.



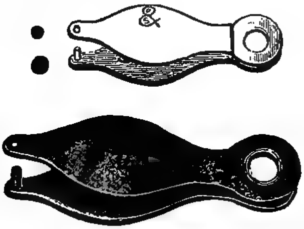
Embyro chick about 34 hours after the beginning of incubation as it appeared under the microscope.

During the ninth, tenth, and eleventh days another series of blood-vessels, emanating from the abdomen to the embryo, will develop rapidly just underneath the inner membrane of the shell, gradually enclosing both the white and the yolk together. By the end of the eleventh day, if the egg is brokn, it will be found that all the body parts and organs have been formed. Even by the ninth day the feathers may be seen. if the egg is broken; and by the thirteenth day the beak and nails have taken on a hard, bony appearanec.

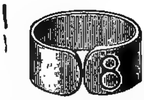


Embyro chick about 42 hours after the beginning of incubation as seen through the microscope.

During the next nine or ten days, the body parts of the chick grow steadily, the eggs showing considerably darker every day, when placed before the tester, and the air space in the large end of the egg gradually grows larger. If, on the eighteenth or nineteenth day, the air-cells in some of the eggs have entirely disappeared and the entire egg shows dark, it means that the chick has burst through the inner membrane of the air-cell and has begun to breathe with its lungs. On the nineteenth day the chicks should begin hatching, and by the beginning of the twenty-first day they should be out.



Poultry punches, used to punch distinguishing marks in the web between the toes.



Leg bands such as we use on baby chicks in pedigree work.

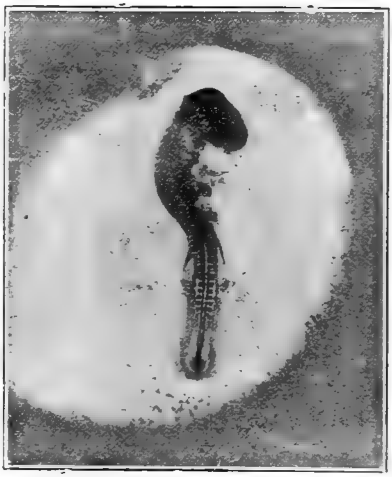
If you can arrange to set a hen and an incubator at the same time, on the same kind of eggs, some interesting and valuable deductions can be drawn by a daily comparison of the development of the chicks that are being incubated, some by Nature's method and some by man's device. If the contents of the eggs from both incubator and hen look alike every day, it is a pretty good sign that you are running your incubator properly. If the air-cells in the incubator eggs are larger than air-cells in the eggs from under the hens, it shows that the contents of the incubator eggs are evaporating, that more moisture is needed. Any other difference in appearance should be studied carefully, with a view to finding out the cause and remedying the same.

### TESTING THE EGGS

"Having provided himself with the best searchlight possible, the student may examine the incubating eggs daily, if his time allows and his interest in the embryonic development warrants such close study. The poultryman should at least test all the eggs on the seventh day and again on the fourteenth day of incubation. For the beginner in the study of incubating eggs, the fololwing plan may prove of advantage:

### INTERESTING INVESTIGATION

"Having selected fresh, medium-sized, nicely shaped, clean shelled eggs, examine each before the tester in a dark room, holding the egg vertically, large end up against the egg-hole, and notice the texture of the shell, whether close-grained and uniform or mottled; the very small size of the air-cell (the border of which may be traced with a pencil for comparison in later tests; and the clearness of the contents of the shell. Probably the shadow of the yolk will appear as a large slightly yellowish or faint golden circular blush near the center of the egg. Place some of the eggs under broody hens and start some at the same time in the incubator. The testing of the eggs from time to time may best be done in a room at least as warm as a 'living-room' (68 degrees) in the dwelling-house. When tests are only made on the fifth and fourteenth days or thereabouts, the examinations may, if necessary, be made in a colder room, even as low as 50 degrees, but the eggs should be covered by a blanket and the testing done rapidly, exposing only one tray full of eggs at a time. If the shells are thin and quite transparent, examine two or three from each lot at the end of the twenty-four hours and detect, if you can, the developing blastoderm as a small, roundish shadow, a shade or two darker than the yolk shadow and against the upper part of the same. At the end of another day, the shadow shows more plainly and with a brighter blush. Its size varies in different eggs, but by this time it should show larger than a dime.



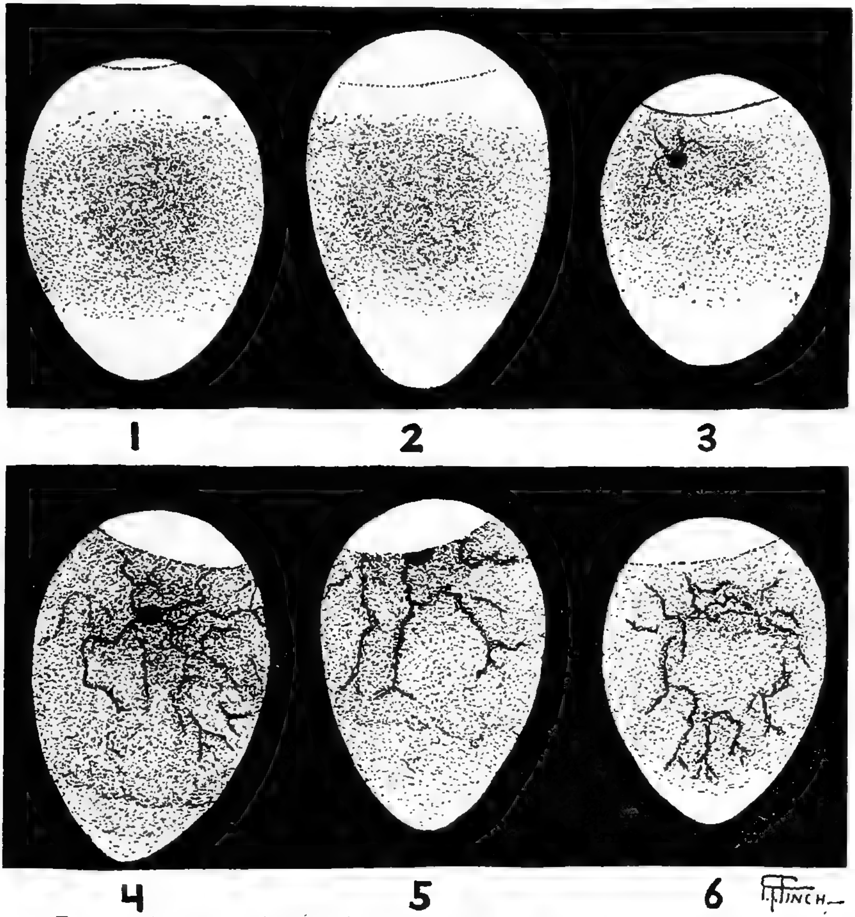
Embyro chick about 48 hours after the beginning of incubation.

### THIRD DAY

"By the end of another day there is considerable increase in the size and the rosy blush has taken on almost a scarlet tinge. Notice that near the border it looks rather larger than in the middle, giving the blastoderm somewhat the appearance of a ring. The same and additional eggs of like period of incubation may be tested from day to day. With a pencil mark on one or more shells the size of the growing blastoderm. The operator will notice, in the handling of the eggs before the tester, that if they are held horizontally and turned, the developing germ swims always at the top of the yolk. Gently moving the eggs also facilitates the finding of the germ spot in the first stages of development.

## FOURTH DAY

"At the end of the fourth day, watch closely for any possible differences in the appearance of the eggs from the natural and those from the



Eggs as they appear when held before tester after seven days of incubation, compared with fresh eggs: 1. Fresh egg. 2. Infertile egg. 3. Weak germ. 4. Strong germ as most commonly found. 5. Strong germ very near air-cell. 6. Germ not visible. Drawing by F. T. Finch.

artificial hatcher. Probably the blood-vessels will not appear distinctly in the eggs from under the hen. If the eggs from the incubator have had a large supply of fresh air and no water has been used in the egg chamber, the veins may show quite clearly.

## FIFTH DAY

"Under the latter conditions, by the close of the fifth day the veins will show up sharply and be very bright scarlet in color. In the middle of the 'spider's web' of blood-vessels can be distinctly seen the chick itself, the very dark small round spot being its eye. If ventilation has been excessive, the bordering vein (sinus terminalis) can very likely be seen. The eggs from under the sitting hen will usually show a picture with the details much less distinct, not half as pretty or pleasing to the amateur operator, but promising decidedly more satisfactory results later. If the incubator has been run with the air sufficiently moist, ventilation properly restricted, and the temperature of the eggs, when the germ is kept within 100 and 102 degrees, the eggs should show an appearance of the embryo like that of the eggs incubating under the hens. Hens differ somewhat in their influence on the development, but the egg at the end of the fifth day should exhibit a somewhat indistinct appearance of the embryo and its appendages. Held perfectly still before the light, the little chick's body may be seen to move; it shows the dark spot (its eye) as a somewhat blurred image; the blood-vessels are rather full, and scarlet in color, but not sharply defined. Fully one-half of the egg appears dark, compared with the other portion, because the blastoderm has by this time extended its membrane and network of veins fully one-half way around the yolk. By holding the egg horizontally with its large end at the egg-hole and looking at the egg endwise, the upper half (perhaps a little more than half) will look quite dark, compared with the lower portion. By drawing the point of a pencil along where the edge of the air-cell shows, it will be noticed that it has enlarged only a little since the first tracing was made on the shell of the egg at the beginning of incubation.

### EGGS THAT ARE DIFFERENT

"Eggs which appear decidedly different from the description just given may be removed from the egg chamber or the sitting hen. Those which are clear or transparent except for the slight shadow of the yolk, appearing much like fresh eggs, except in the larger size of the air-cell, are infertile and cannot develop a chick. They are frequently sold for use in bakeries. A ring of blood indicates death and the dead germ may show as a small dark spot, apparently stuck against the inside of the shell within the circumference of the 'blood ring.' As already indicated, this condition may be caused by too great heat, too much ventilation, or both acting together. Possibly the veins may, in the rare cases of some embryos, be thin-walled and weak, so that they burst even under a hot-blooded sitting hen.

### CHERUBIC CHICKS

"In some eggs the dark 'dead spot' appears unaccompanied by a 'blood ring.' Sometimes the contents of the egg present a cloudy or muddy appearance, and the germ-mass, if visible, moves only when the egg is moved. Life in such eggs has started and stopped. If not removed, they soon change, under the heat, to typical 'rotten eggs' and are a menace to the 'living eggs.' All these conditions of hemorrhage, muddiness, and stagnation presents a very different picture from those of the bright blood-vessels, clearly marked areas of living tissue and throbbing, wobbling embryonic activity as seen through the thin transparent egg-shell.

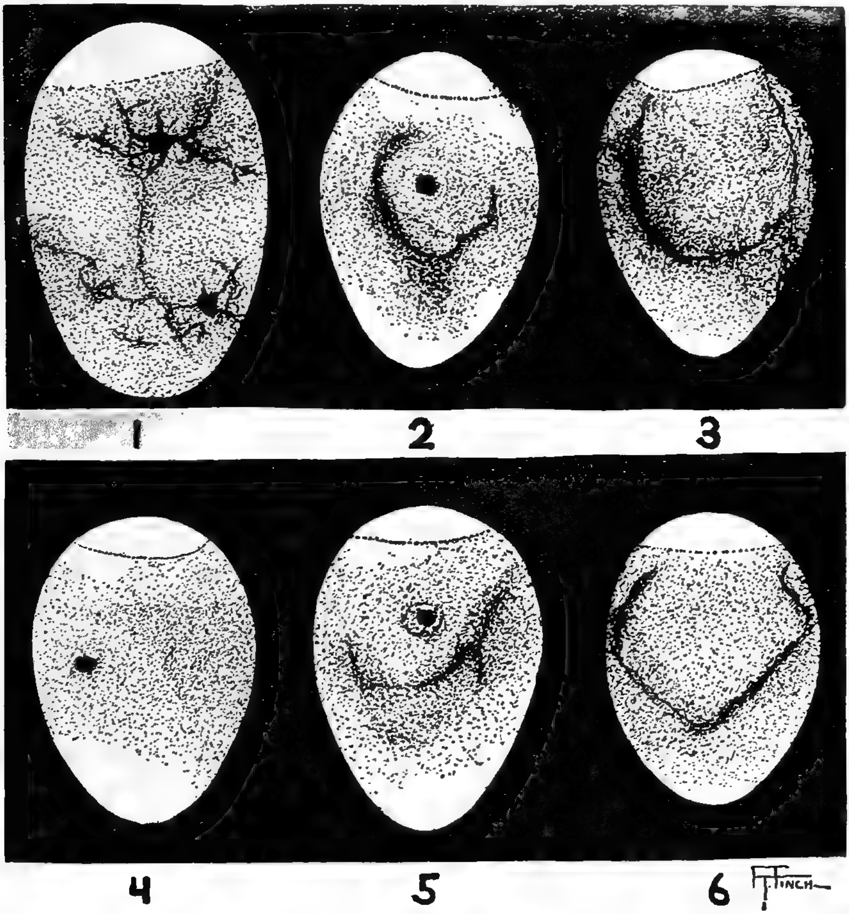
"If testing eggs that have brown shells, the beginner in the business may be in doubt as to some of the eggs. These may be returned to the incubator and tested again later.

### NO "MIXED PICKLES"

"Do not attempt to fill up the empty spaces on the trays with fresh eggs. If it is desired to have the trays full of live eggs after testing out of 'infertiles' and dead and dying germs, there are two ways of doing it. Either start an extra incubator (termed a 'feeder') at the same time that the regular machine is set in operation, or place eggs enough under broody hens to supply the living eggs at the desired time. The latter plan will also give the poultryman opportunity to compare the hatching of eggs started in the incubator with those incubated for five to seven days by the natural method, both lots being marked for identification and subjected to like conditions of machine incubation after the fifth or seventh day's testing. The results in hatching and in the brooder may convince the experimenter that the key to success in both incubation and brooding is to be found in the conditions of the first week of incubation.

## SIXTH DAY

"Taking up our testing of the eggs at the end of the sixth day and examining closely the region of the air-cell, we may discover that the veins of the blastoderm have passed under the inner membrane of the air-cell and in some cases have emerged on the opposite side. The embryo lies quite deeply enclosed in the amnion and moves readily in the clear amniotic liquid. One of the dangers of too much ventilation (the 'drying-down' process, so-called) is the thickening of the albumen, especially near the inner shell membrane, and consequent difficulty in the pushing of the blood-vessels across under the air-cell. If this occurs and the capillary veins begin to fold on themselves along the borders of the vascular area, the under surface of the egg may remain continuously clear or yellowish in appearance for some days, perhaps until the end of the incubation period. Accompanying this appearance, there is likely to occur a danger-



Dead germs seventh day of incubation (2, 3, 4, and 6). 1. Live germs in a double yolked egg. 2. Blood ring and germ stuck to shell. 3. Blood ring. 4. Floating germ. 5. Floating germ and blood ring. 6. Blood ring. Drawing by F. T. Finch.

ous diminishing of the fluid contents of the amnion and consequent restriction of the freedom of movement of the embryo and forcing of the same to come closer to the inner shell membrane than is best for its healthy development.

### SEVENTH DAY

"Seven days of embryonic life usualy develop in the egg an organism that is decidedly lively. Its gymnastic performance under water apparently includes swimming, diving, disappearing and re-appearing acts. By this time the network of veins has pushed further around the yolk and may perhaps be perceived by holding the small end of the egg to the egg-hole and looking at the under side. By opening an egg at this stage in a bowl and examining the surface of the yolk, an excellent idea may be obtained of the way in which the blood-vessels daily creep forward in their efforts to gradually enclose the yellow yolk. If these veins in the incubator eggs, at about this stage of development, or even earlier, appear to halt and, instead of proceeding to completely surround the yolk, begin to fold on themselves and to form distinctly darkened bands, as seen before the tester, then there is trouble ahead. If this abnormal development occurs, a portion of the under surface of the yolk is left bare of blood-vessels, which signifies a reduction of nourishment supplied to the embryo and a consequent retarding of its development. The probable causes are excessive ventilation and possibly too low a temperature of the lower parts of the eggs.

### EIGHTH DAY

"At the end of the eighth day the yolk should be completely surrounded and enclosed by the network of veins (termed the vascular area of the umbilical vesicle). The contents of the egg are getting darker. The clear space in which the embryo dives about is the amnion. Sometimes the embryo is hardly visible; again, it shows up quite plainly, but should not appear distinct in outline either as to its body or its dark eye, the latter may at this stage appear as large as a medium sized pea.

### NINTH DAY

"By the ninth day the second series of veins (those of the allantois) may perhaps begin to be visible. The body of the egg is darkening gradually because of the extensive development of the veins and fine capillary blood-vessels. Mark those eggs which darken most evenly and have almost no transparent portion except the air-cell and notice how they hatch, or, if you prefer, mark those that have distinct transparent or yellowish areas, especially around the small end and along the under side of the egg, and see if they ever hatch.

### TENTH DAY

"By the end of the tenth day the veins of the allantois should certainly show, though not too sharply defined, through the shell, on the upper side before the tester. Next day they should be evident on the under side. The embryo may perhaps be seen, or its movements detected by the shadows cast against the shell. At the close of the eleventh, twelfth and thirteenth days the picture before the egg-tester becomes continuously darker. The growing chick uses much more oxygen, which calls for increased ventilation, as compared with the normal amount of air required in the early days of incubation. The embryo chick increases in size daily.

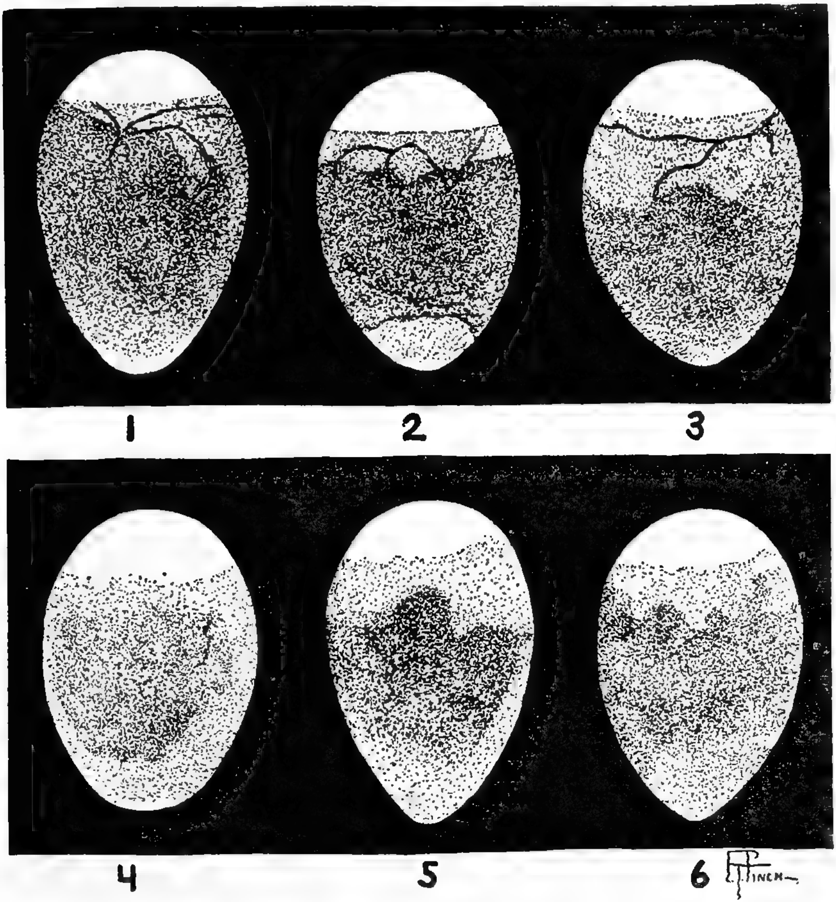
### FOURTEENTH DAY

"By the end of the fourteenth day the air-cell has gradualy increased in size until it is about one-half inch deep. The egg is nearly opaque except the air-cell and a space around the egg next to the borders of the air-cell, in which only the largest veins of the allantois are conspicuous. The chick is practically fully formed and has begun to increase rapidly in size.

"A daily inspection of the eggs from the fourteenth to and including the eighteenth day shows the darkening process continued as the chick enlarges. By this dissipation of the amniotic fluid and the wastes or oxidized materials of the body, the air-cell is greatly enlarged and comes to occupy one-fifth to one-fourth of the interior space of the egg.

### EIGHTEENTH DAY

"On the eighteenth day the egg should appear before the searchlight as a black oval, save for the transparent air-cell and possibly a slight translucent area next to the air-cell, in which may sometimes be distinguished the very black vessels and an occasional movement of the chick.



Eggs at fourteenth day of incubation: 1. Strong live embyro. 2. Live embyro. 3. Weak live embyro. 4, 5, 6. Dead embyros. Drawing by F. T. Finch.

### NINETEENTH DAY

"By the end of the nineteenth day the air-cell may appear dark, because of the chick's breaking through the inner membrane and beginning to use his lungs for breathing.

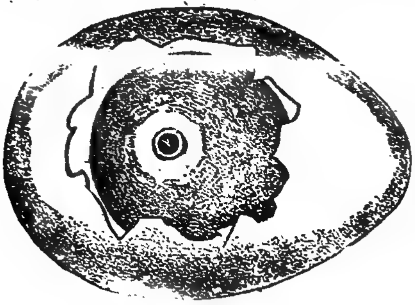
### TWENTIETH DAY

"Keep the door of the egg chamber closed during hatching. The blood of the allantois system of veins is drawn into the chick's body, and the lungs must now do their duty by aerating the blood as it passes through them. The chick must have air to breathe, and by the twentieth day should break through the shell. Before the chick emerges from the shell, the umbilical vesicle, with what is left of the yolk, should be drawn into the abdomen, and the navel healed after severing the allantois, which is left behind. (Examine the inner surface of an egg-shell from which a chick has just hatched and note the network of emptied blood-vessels which can be distinctly traced all over the lining membrane of the egg.)

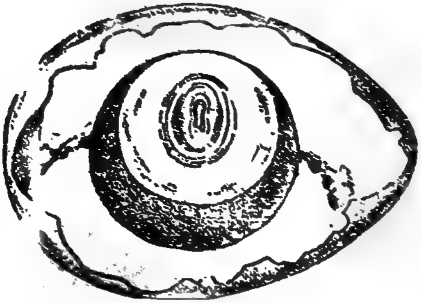
### BURSTING THE BARS

"One of the most interesting things in this interesting world may be seen in an incubator at hatching time. The observer should sit down before the glass door and take time enough to watch the progress from beginning to end. The little chick is in a tight place, but is provided with means to get out. It first breaks the weakened shell through near the edge of what was the air-cell. This is done by the aid of a small, hard, horny projection on the top of the chick's bill near its tip. After cracking through the shell and 'catching its breath,' the chick proceeds to work its shell breaker gradually around the egg, stopping at short intervals to rest and get up its courage and muscle for the picking, sawing, and lifting of the shell and its lining. After the shell is broken part way around, the little prisoner will occasionally exert all its strength in a straining effort to burst out. If this plan does not succeed, the cracking, piece by piece, is renewed. It may be continued until the shell is broken completely around and held only by parts of the lining membrane. After one more breathing time, the little creature, with a mighty effort, snaps the last bands and tumbles out—a wet lump of sprawling awkwardness, but evidently possessed of a strong desire to learn 'the ways of chickendom.' Its downy covering soon dries off, and then the fluffy fellow ought to be photographed as the prettiest of all poultry pictures."

AFTER 3 HOURS OF INCUBATION



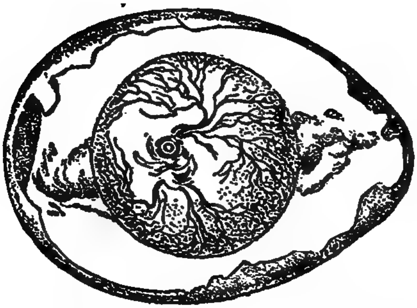
2ND DAY

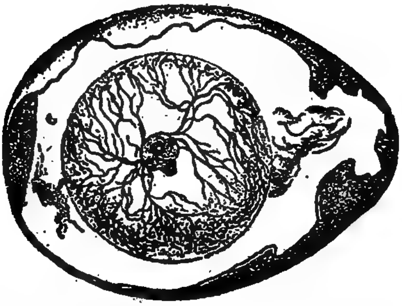


### DEVELOPMENT OF A CHICK

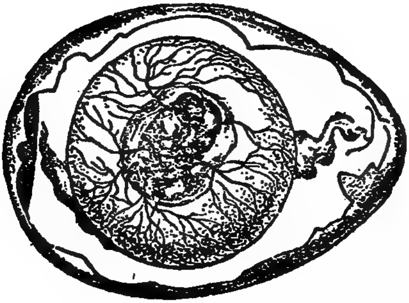
A French scientist once removed a small portion of the shell on either side of an egg and fitted in the openings small pieces of glass, through which he watched the development of the chick. The following is his report of the experiment:

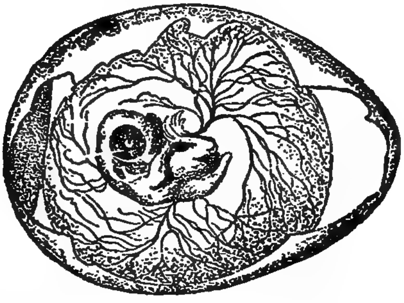
"I placed the egg with a glass bull's eye in an incubator run by clock work and revolving each hour, so I had the pleasure of looking through and watching the change upon the inside at the end of each hour. No changes were noticeable until after the end of the twelfth hour, when some of the lineaments of the head and body made their appearance. The heart began to beat at the end of the 24th hour, and in 48 hours two vessels of blood were distinguished, the pulsation being quite visible. At the 50th hour an auricle of the heart appeared, much resembling a lace or noose folded down upon itself. At the end of 72 hours we distinguished wings and two bubbles for the brain, one for the bill, and two others for the fore part and hind part of the head.


4TH DAY

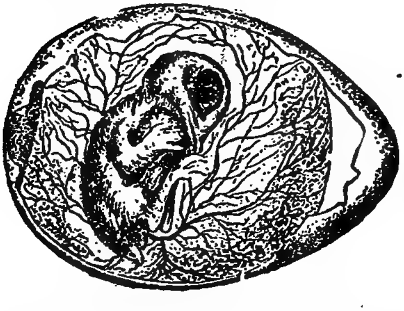

5TH DAY

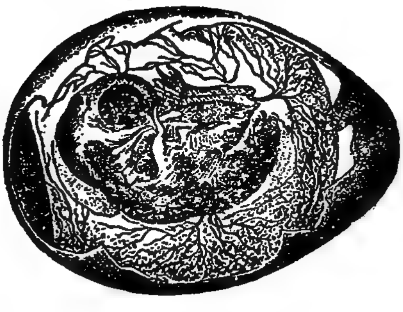
"The liver appeared at the end of the fifth day. At the end of 131 hours the first voluntary motion was observed; at the end of 148 hours the lungs and stomach had become visible, and four hours later the intestines, the loins, and the upper mandible could be distinguished.


6TH DAY


9TH DAY

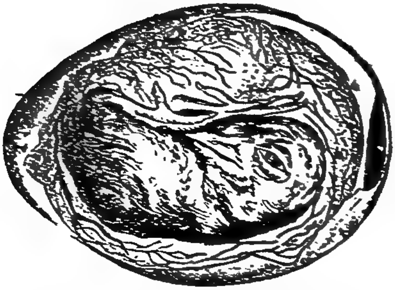
"The slimy matter of the brain began to take form and become more compact at the beginning of the seventh day. At the 190th hour the bill first opened and the flesh began to appear on the breast. At the 199th hour the sternum appeared. At the 210th hour the ribs had begun to put out from the back; the bill was quite visible, as was also the gall bladder.


11TH DAY

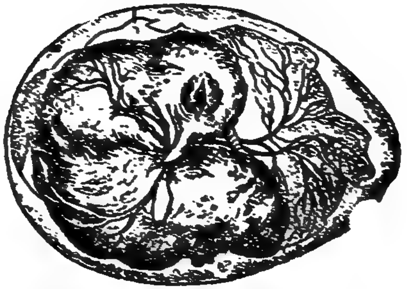

12TH DAY

"At the beginning of the 235th hour the bill had become green, and it was evident that the chick could have moved had it been taken from the shell. Four hours more and the feathers had begun to shoot out and the skull became grisly. At the 264th hour the eyes appeared and two hours later the ribs were perfect. At the 331st hour the spleen drew up to the stomach and the lungs to the chest.

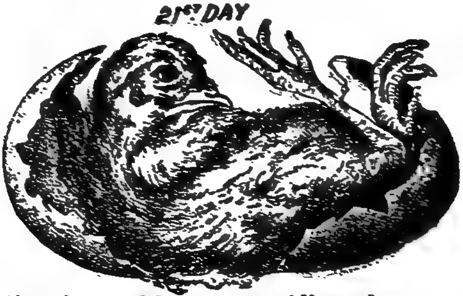
15TH DAY



18TH DAY



"When the incubator had turned the eggs 355 times, the bill was frequently opening, as if the chick were gasping for breath. When the 351 hours had elapsed, we heard the first cry of the little imprisoned biped.



"From that time forward he grew rapidly and came out a full fledged chick at the proper time."

### AT HATCHING TIME

When the eggs begin to pip, the incubator should be closed, and kept closed until the hatch is over. There are at least two reasons for so doing. The first is that the hatch progresses more uniformly and more rapidly when a temperature of 103.5 to 104.5 degrees is maintained at hatching time. The second reason is that newly hatched chicks are exceedingly tender before they are dry. Opening the door and letting in the cold air is apt to chill them and cause trouble later.

Before the machine is closed for the hatch, the moisture pans or devices should be taken out, and provisions made so that the chicks can fall down into the nursery.

If the incubator has a glass front, and is setting in a light room, it is well to hang a curtain of burlap or dark colored cloth over it. They then remain quiet and do not walk about over the eggs that are just pipping. This also keeps the chicks from crowding to the front until they are thoroughly dry and strong.

Do not worry about helping the chicks out of the shells. Those that are unable to get out by themselves are weaklings, as a general rule, and not worth bothering with. The strong, vigorous, livable fellows will have no trouble getting out.

Do not be in a hurry to transfer the chicks to the brooder. They are better off where they are for the first 24 to 36 hours.

"Do not open the door for any purpose after piping starts.

"Close the ventilators when chicks begin to come out, and keep them closed until the hatch is completed, unless the hatch is very large and chicks are crowded, in which case ventilators may be opened when the hatch is about two-thirds off.

"Always open the ventilators and wedge the door slightly ajar after the hatch is over and trays containing shells have been removed.

"Allow the chicks to remain in the incubator from twenty-four to thirty-six hours.

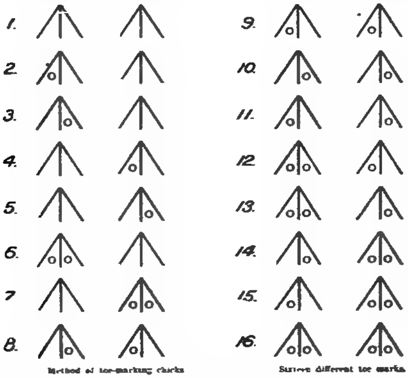
"Give nothing to eat or drink until the chicks have been placed in the brooder. In making the transfer, keep them well covered to guard against chilling."

### IS A NURSERY DESIRABLE?

Many of the best machines have nurseries below the egg trays, so the chicks can drop into the same; also, some of the good incubators have no nurseries. Therefore, this is a much debated question. It has its advantages and its disadvantages.

The greatest disadvantage of the nursery lies in the fact that it is impossible to keep the nursery and the egg trays at the same temperature, and it is not unusual to find a difference of ten degrees between the egg tray and nursery in some incubators. By subjecting the newly hatched chick to such a sudden change in temperature, both bowel and lung trouble frequently result—thereby reducing the vitality of the chicks and making it impossible for them to thrive. The use of the nursery will many times explain why an incubator will frequently produce a good hatch, only to have the chicks begin to die within a few days after they are placed in the brooder.

Personally, I can see no disadvantage in a nursery if rightly used; on the other hand, there are some things in its favor. When hatching the chicks should be kept on the egg tray until the hatch is practically completed. It is true that a large number of struggling chicks interfere with those that are hatching; but, if the incubator door is covered and the egg chamber made dark, the chicks will remain very quiet. The warmth, moisture and body contact of the hatched chick seems to aid the weaker and later hatching chick to free itself from the shell. So it is advisable to keep the chicks quiet and keep them all on the egg tray until the hatch is practically completed, then open the egg tray and allow the stronger chicks to drop to the nursery below. The egg chamber is too hot for the chicks to remain in long after they have shaken off the shell covering, and for this reason it is better that the chicks, after they have thoroughly dried off, drop to a nursery tray.

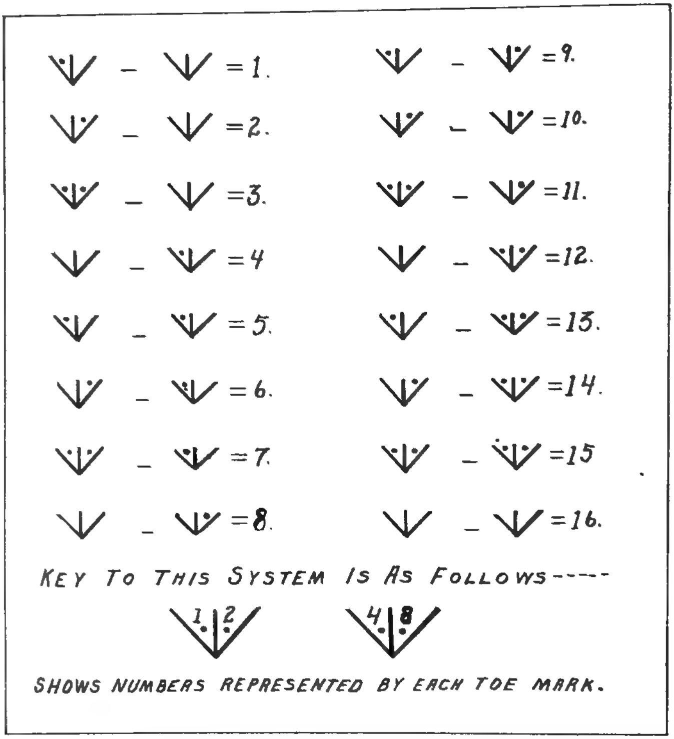


This shows how the web between the toes of the baby chicks can be punched with a toe-marker so as to tell the pedigree and age of the different chicks. If you do not care to put leg-bands on your chicks, or if you are not hatching from more than sixteen different hens, this is a very good method of marking them. Some clip the web between the toes, with a sharp pair of scissors and claim this answers as well as using a toe-punch.

There is a considerable difference in the temperature on the bottom of the incubator, but not enough to work any injury if used as directed. It will probably be about 95 degrees in the nursery part. This heat is sufficient if not used until the chicks are thoroughly dried. This helps to harden them for the brooder. If the chicks are allowed to drop below as they hatch, you will find that the remaining chicks have a tendency to dry out and stick to the shell. For this reason, it is best to keep all chicks above until the hatch is practically completed.

### PLAN FOR MARKING CHICKS' TOES

There are two dfferent methods of marking chicks' toes so as to distinguish one hatching from another. By the use of a small toe punch, a poultryman can mark his chicks so that any time during the year he can pick up a bird anywhere on his farm and this method of marking chicks will tell him the pen number, the month in which the chick was hatched, the year in which it was hatched, or be useful for straight pedigree work. The key to this system is explained as follows:


=1.
=2.
=3.
=4
=5.
=6.
=7.
=8.
=9.
=10.
=11.
=12.
=13.
=14.
=15
=16.
KEY TO THIS SYSTEM IS AS FOLLOWS----
1
2
4
8
SHOWS NUMBERS REPRESENTED BY EACH TOE MARK.

A punch mark on the outside web of the left foot should represent figure one (1). A punch mark on the inside web of the left foot represents figure two (2). A punch mark on the inside of the web of the right foot represents figure four (4). A punch mark on the outside web of the right foot represents figure eight (8).

You can then take any combination of punches that you wish and they will represent different combinations of pen numbers, months or years up to 16. For instance, an outside toe punch on the web of the left foot would be figure 1 and an outside toe punch on the web of the right foot would represent figure 8 and the combination of 1 and 8 would equal number 9. If both webs of the left foot were punched, it would mean a combination of 1 and 2, which would equal 3. If both webs of the right foot were punched and none on the left foot, that would mean a combination of the figures 4 and 8, which would be 12.

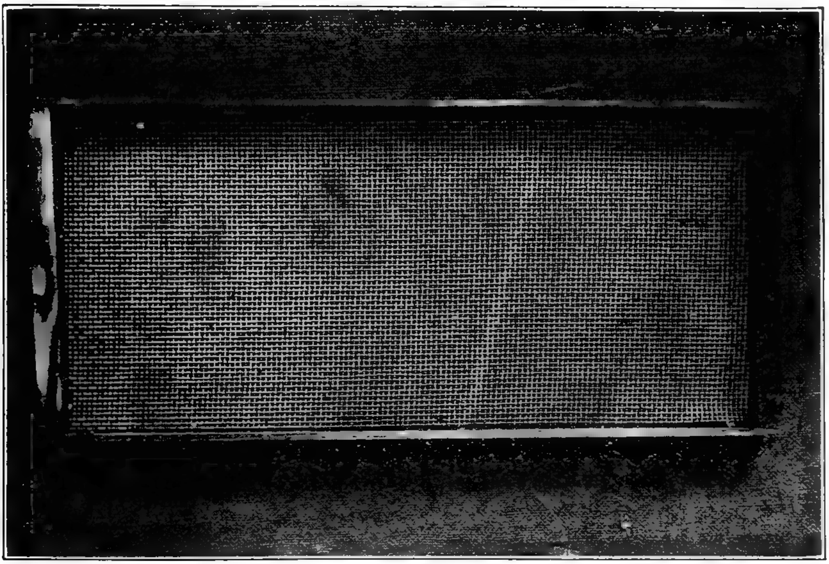
This is the best, most practical and useful system of toe punching that I know of. There is no system that equals it outside of the leg banding and wing banding as explained in another place in this lesson.

## WIRE PEDIGREE TRAYS

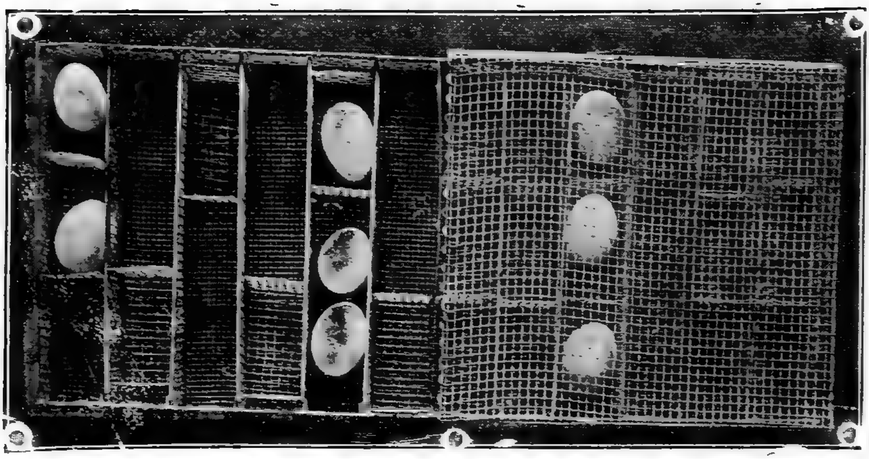
Every poultryman should trap-nest a few of his best birds for at least a portion of the year and pedigree the chicks from the same. If a poultryman will begin to trap-nest in November and keep it up through the breeding season, he can discontinue it for the remainder of the year. The record made in those months gives you all the information you need as to which are your best layers and which you should breed from.

If you are to make any real and rapid progress in the poultry business, you should breed only from your best birds, and not mate your pens by guesswork only, as is usually done. The only way you can really know which birds, male or female, produce the best layers, the best birds in color and shape, is by pedigreeing some of the chicks from a pen which you think are your best birds.

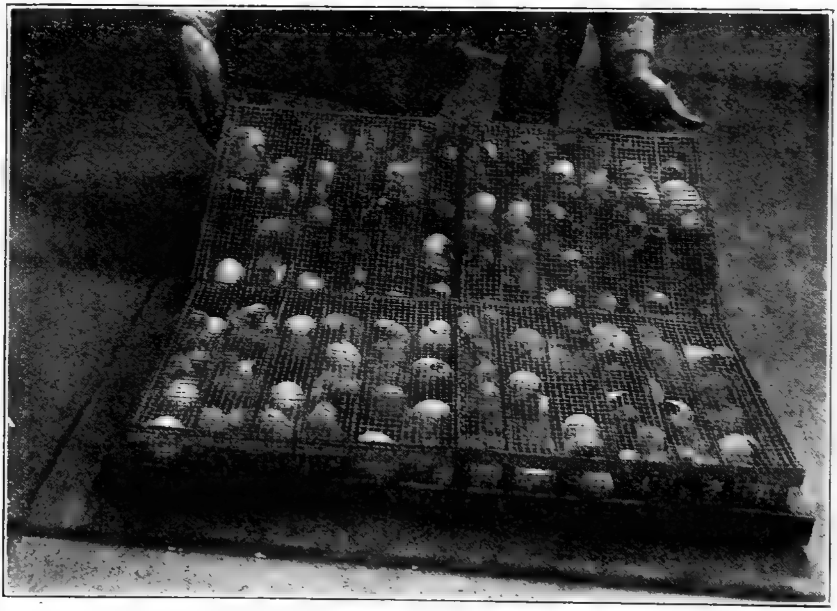
If you have your hens mated in pens during the breeding season and you know the band numbers of the male at the head of the pen, and the band numbers of the females, these numbers should be marked on the end of the egg when the hen is released from the trap-nest. You then know the pen number, the number of the male that fertilized the eggs, and the number of the hen that laid it. All of the eggs from the different hens and males can be placed in the tray of the incubator together. They can remain there and be handled in the ordinary way until the eighteenth day, when you quit turning them and just before time for them to start to pip. Then, if you wish to pedigree the eggs and keep a record of the sire and dam of each chick, it is necessary to use some means to have each hen's eggs hatched separately, so the chicks from the different hens can be marked before they become mixed. If you can hatch them separately and put leg-bands on them or toe-mark them, or clip the web of the feet, or put some other distinguishing mark on each chick, and then make a record of every chick, their sire and dam, in your record book, you have its pedigree. When the chick grows up, you know whether its father and mother were crossed well, or dove-tailed, as it were, in breeding for best results. Some matings which you thought were your best



Pedigree Tray showing hardware cloth bottom.



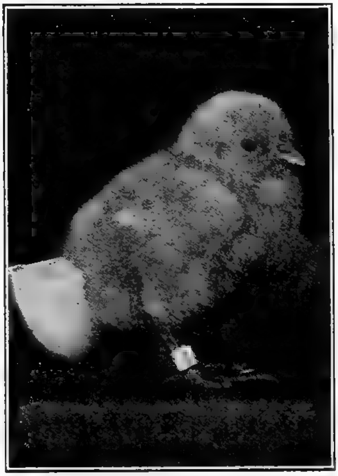
Pedigree Egg Tray showing the eggs in separate compartments. Eggs are not placed in the pedigree trays until the 18th day. The trays shown here were made by a tinsmith. The trays are 2¼ inches deep and the partitions are two inches apart. Pieces of hardware cloth can be bent so as to subdivide the compartments as here shown.



Pedigree Trays as they appear just after ahe eggs are through hatching. The chicks are still in the trays with their egg-shells. The tops can now be removed and each chick marked or branded and the record made. If your tinsmith cannot make them, these can be bought from almost any good incubator company or poultry supply dealer.

will prove absolutely worthless and you have to market all of their offspring. Others will prove the opposite, and they are the kind which are worth their weight in gold to any poultryman.

Pedigree trays for this purpose can be bought from any of the better incubator companies or poultry supply dealers. Your hardware merchant can make them for you out of hardware cloth. They should be just the proper size to fit right on the inside of the frame of your incubator tray. The wire bottom of your incubator tray can be used as a bottom for your pedigree trays. All you are required to have made are the sides, ends, tops, and partitions as shown in the accompanying illustrations. The trays should not be less than 2¼ inches deep and the partitions should be at least two inches apart. Each hen's eggs can be put in a separate compartment. By bending short pieces of the hardware cloth, the sections can be subdivided for a single egg even. If the eggs are marked on the small end, that portion of the shell will usually remain in the tray with the chick, unbroken, so that the records and pedigree can easily be kept.



The small bands are twisted about the leg of the chick.
Leave room for growth.

## CORN-POPPER PEDIGREE TRAYS

Figure 78 shows the method used by the American Poultry School for handling eggs in incubators at hatching time to "pedigree" the chicks. Ordinary two-quart corn-popper wire baskets are used. Marked eggs from any one individual hen or pen are placed in a basket on the morning of the eighteenth day of incubation, and the basket is labeled accordingly. When the hatch is completed, the operator knows the breeding or parent of each chick, and it is so marked.

In most cases the hen influences the quality of the offspring as much as does the male. In some cases her influence is greater. From the viewpoint of egg production or Standard quality, experience has proved it is equally as important to know the dam, as well as the sire, of every chicken raised.

Trap-nest the females during the breeding season; numbering each egg with the leg-band number of the hen that produced it; handle the eggs during incubation in the manner set forth in this article, in order to insure accurate knowledge of what eggs produced certain chicks; and follow this with a system of pedigree banding—these things give us a sure method of knowing the parents of every chick raised.

Not every male or female of the choicest quality as a layer or exhibition bird produce a like quality in all of their offspring. Some produce a small per cent that are extra choice, the balance poor to medium; others produce a few of the very best quality, with a small per cent medium; while many chicks, even from the best matings, are absolutely culls.

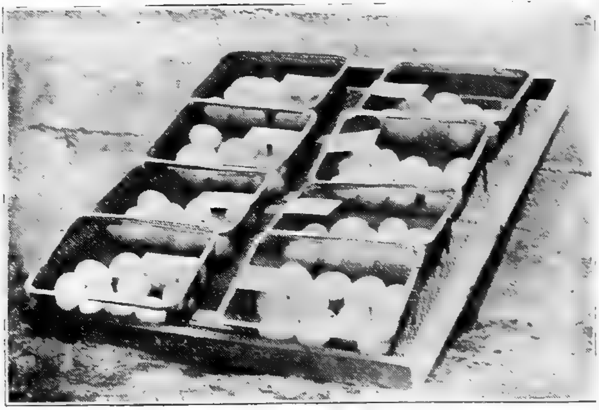


Fig. 78.

A male or female that produces the best of youngsters—chicks much better in quality than their parents and that have very few or no culls at all among them—are valuable birds to their owner and should be kept in his breeding yards to the end of their days.

A real choice chick, unfortunate in having a large per cent of its full brothers and sisters prove to be of cull or only medium quality, is not as valuable to save for breeding as the choice chick whose full brothers and sisters average very good.

Many females seldom, if ever, produce an egg that hatches; others produce some fertile eggs, but the embryo chick dies in the shell before hatching. Some females lay eggs that produce chicks which prove to be of low vitality, are hard to raise, and seldom develop into good laying, breeding, or exhibition birds. Such birds usually are the first to fall prey to any colds or common chicken ailments. I have known cases where a

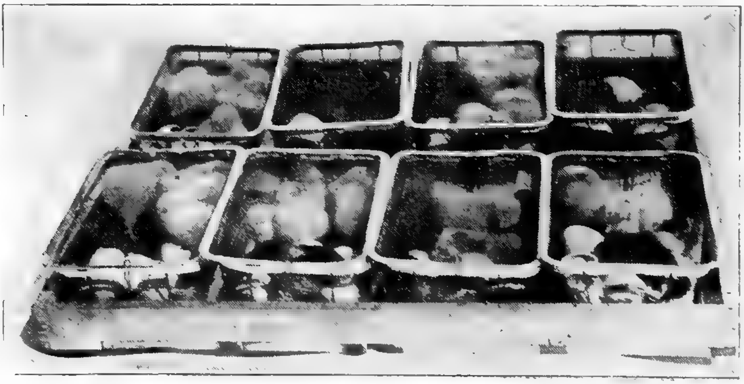


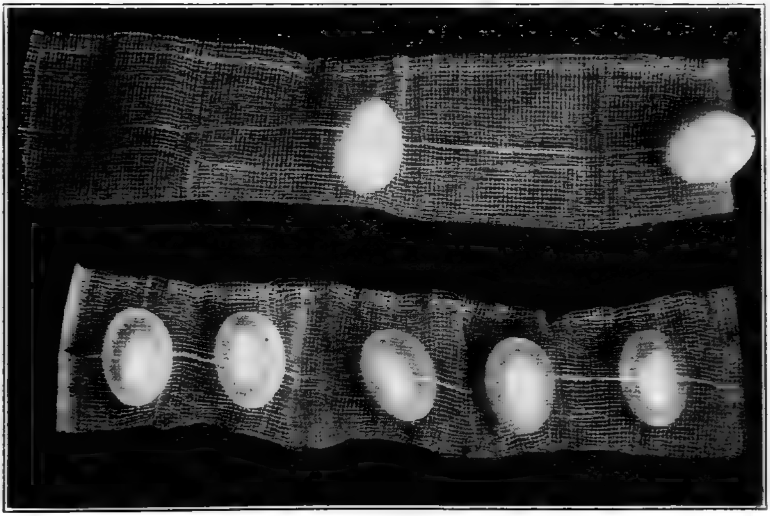
Fig. 79.

fine quality female was bred for three years without a chick ever being raised from her.

I have in mind a well known breeder who three years ago "trapped" his breeders and pedigree hatched the youngsters for the first time. As the summer wore on he noticed the shape and color of almost all chicks from his best mating of the season were very fine, but he was keenly disappointed to discover that about one-fifth of all chicks from that mating had side sprigs on their combs, also considerable white on their ear-lobes. He condemned the male (as most breeders do) that had been at the head of the mating. I suggested he investigate his records to see which females were the mothers of the disqualified chicks. When this was done, the good man was amazed to find that one hen was the mother of all the disqualified chicks produced from that mating. That same hen had won second as a pullet and first as a hen at two of the world's largest exhibitions. A further checking disclosed the fact that all of the choicest youngsters were from the most unlikely females contained in his best mating the previous spring. Such important facts and scores of other facts of equal importance to the breeder can be known positively only through trap-nesting and pedigree hatching.

On the twenty-acre Poultry Farm operated by the American Poultry School, every female worth keeping is worth trap-nesting, at least during her pullet year. This proves her actual laying ability. Their eggs are marked with the number on the band which was sealed on the leg of the female at the time she was placed in the breeding-pen. The eggs from different females, if placed in incubators, are sorted on the afternoon of the seventeenth or the morning of the eighteenth day, and eggs which are marked as being laid by a certain individual are placed in a pint, a quart, or a two-quart size wire corn-popper basket. The lid is fastened down and a record card, showing what the basket contains, is made and fastened underneath the lid hook. All eggs in the tray are treated in a like manner. The baskets are next set in the trays, which are placed back in the machine.

Figure 79 shows chicks from eggs which were first divided according to the pen or female that produced them. As each popcorn-popper basket is removed after the hatch is completed, the chicks in it are marked.



Pedigree Sacks made from mosquito netting. Each sack should be four inches wide, and each egg can be separated by taking a few stitches in the sack.

When the hatch is finished, each basket of chicks is taken from the machine and opened, and the chicks are banded with small open pigeon leg-bands. The breeding leg-band number of the hen that laid the egg is recorded on a permanent record sheet and opposite her number is placed the pedigree band number of each chick hatched from her eggs. When the chicks are about eighteen to twenty-four days old, the small band is removed from the leg. A small slit, about one-eighth of an inch long, is made close to the edge of the skin which creates the "fan" portion of a fowl's wing when it is opened. This is the skinny, or what you might call the web, portion of the wing when outstretched. The pigeon band removed from the leg is placed through this slit in the wing skin. The band is then folded shut and the chick is marked for life. They never lose their wing-bands. Feathers grow over this portion of the wing and the wing-band is never noticed, except when a careful search is made among the feathers expressly to find it.

When it is desirable to know the chicks hatched from eggs produced by certain pens instead of females, larger popper baskets can be used. Most hardware stores handle them in sizes from pints to one and two gallons. The prices of these baskets range from fifteen to sixty-five cents, depending upon the size.

There are other methods commonly practiced in incubation to tell which egg produced the chick, among which are small hand-made mosquito netting bags and manufactured pedigree trays. We have found chicks often work their way out of the netting bags, or the mosquito netting holds the shell over the half hatched chick and it dries there and sometimes kills the chick. Also, it requires more time to pedigree hatch when bags are used. The main objection to almost all manufactured pedigree trays is that the divisions are not sufficiently numerous to permit economical use of tray space when the incubator tray contains from one to four eggs each from several different females and as many as ten or twelve fertile eggs in the machine from a certain female. In such cases, we use different size popper baskets, using the one best suited to the number of eggs from any female. This method is sure, easy, and a time and money saving method. It also leads you to certain success in building up an egg producing and Standard-bred flock that will win prizes for you, providing your other methods are correct.

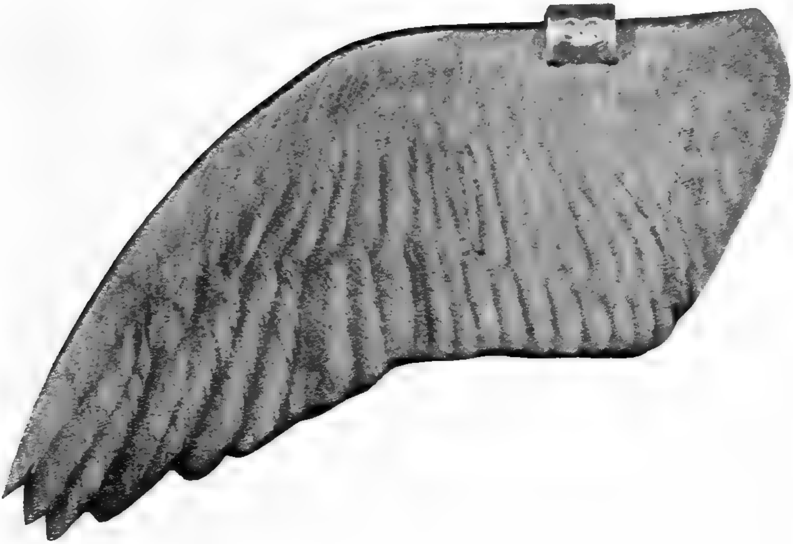
## MOSQUITO NETTING PEDIGREE SACKS

If you do not care to provide any other kind of pedigree trays, ordinary mosquito netting may be used for pedigreeing eggs. Mosquito netting can be cut so as to make a sack four inches wide when folded over and sewed in the shape of a sack. One end should also be sewed up. These can be made in advance and have them ready for the eighteenth day of incubation. The eggs can be assorted and all of one's hen's eggs put in one sack. Two eggs require a space in the sack about four by six inches. The sacks can be sewed up at that point and another egg or more eggs put in the same sack. A single egg requires a space of about four by four inches. Other eggs can be put in until the sack is full. Between every hen's eggs, if one sack contains more than the eggs from a single hen, the different eggs should be separated by sewing across the sack. There is room then for each chick to hatch, and the shell remains in the sack with it, so it can be pedigreed and marked or banded according to the numbers on the small end of the egg. The sack can be clipped with a pair of scissors whenever you are ready to pedigree the chicks, which should be done as soon as possible after the hatch is completed. Every poultry raiser should hatch at least a few eggs from his best birds and pedigree and mark them in this way each season, so as to have a few males of known parentage and of known qualities from which to breed.

## WHAT IS A GOOD HATCH?

Don't expect too much from your eggs, your hens, or your incubator. If you hatch fifty per cent of all the eggs you set, you are doing as well as the average. The higher the fertility the better the hatch is likely to be.

If the germs look weak or there is a large per cent infertile, you can expect a rather poor hatch from the eggs that remain in the machine. If you hatch fifty per cent or more of the eggs set, you have no reason to complain. Try to hatch a much larger per cent if possible. Sixty per cent is considered a good average.



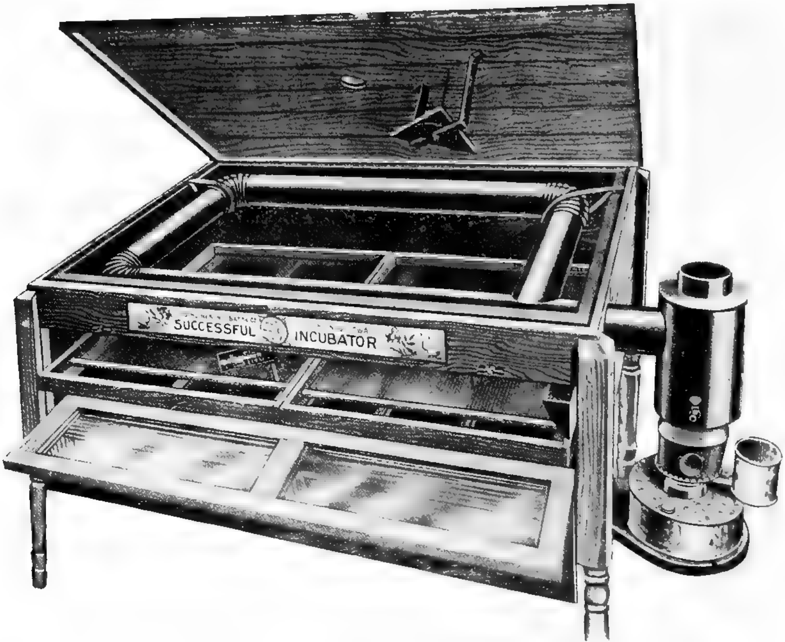
After the bands have become too small for the leg of the chick, the band can be removed from the leg and placed in the web of the wing. Make an incision with a sharp-pointed pen-knife, small blade. Make this incision in the middle joint of the wing and as far from the body of the chick as the web will permit. The bands should be changed to the wing when the chicks are from four to six weeks old. It is best to do this late in the afternoon or at night; then the chicks will not pick at one another's wings. Use the smallest bands you can get.

## CUSTOM HATCHING AND DAY-OLD CHICKS

Many farmers and poultry raisers now prefer to send their eggs to a central hatchery rather than bother with hens or incubators. Since the advent of mammoth incubators, the demand for custom hatching is increasing rapidly. For the same reason that the farmer has learned to haul his grain to grist mill, we believe he will sooner or later begin to take his eggs to a central hatchery and have the hatching done by an expert rather than do it himself. If these machines are in the hands of trustworthy operators, they can gain the confidence of the people by giving them big hatches of strong, healthy chicks.

The day-old chick business is also on the increase. To be able to start in the chicken business with any number of chicks is making poultry raising attractive to thousands of people who prefer to buy chicks outright. This is true with people in towns and cities who desire to raise on a town or city lot, who haven't room to carry breeding stock. In many of the most thickly settled poultry communities, there are large central hatcheries equipped with mammoth incubators, which have over 200,000-egg capacity in some cases. Many of the largest and most successful egg farms in the vicinity of Petaluma and Hayward, California, and in many other poultry centers, buy their chicks from these hatcheries. The operator of such a hatchery should use only good eggs from healthy stock, which are good in color and shape and which have some egg-laying ability. If you attempt such a thing, build up a reputation for operating a sanitary hatchery and of selling first-class chicks.

If you averaged a 60 per cent hatch, and paid 2½ cents each for your eggs, each chick would cost you four cents; if you paid $5 per hundred or five cents each for your eggs, that would make your chicks cost you 8 1-3 cents each.



The above is a photograph of the "Successful" Incubator, showing the double glass doors in front and the heating arrangement, as well as an interior view of the Incubator.

In the latter case, to sell the chicks at $20 per hundred means 20 cents each, as against the cost of eight cents, a profit of 12 cents; to sell at $15 per hundred, seven cents profit on each; $12 per hundred, four cents profit. The expense of labor and fuel and other expenses must be deducted from this. The labor-saving devices on the mammoth machines reduce the cost of hatching to a minimum. The prices to be charged for your chicks would have to be determined largely by the cost of your eggs and the quality of the chicks which you offer. We recommend the use of mammoth machines for large poultry farms, custom hatching, or the day-old chick business. We prefer to sell $25.00, $35.00, and $50.00 per hundred chicks and give our customers their money's worth. It is impossible to furnish a good chick from cheap eggs that have no quality back of them.

## DUCK, GOOSE AND TURKEY EGGS

The large duck ranches do all their hatching with incubators. Duck or goose eggs require more moisture than chicken eggs. The methods of supplying this vary greatly. We have had best results by sprinkling the eggs with lukewarm water before replacing them in the incubator each time. Turn duck eggs, but do not cool so long as in the case of chicken eggs. Turn, then sprinkle well, and place eggs back in the machine. The water has a cooling effect on them.

Some start duck eggs at 101 degrees the first week and gradually increase the temperature to 103 degrees. Most duck raisers begin with the temperature at 102 degrees, where it is held until the fourth week, then incerased to 103 degrees.

As a rule, we do not advocate hatching turkey eggs in an incubator, although it can be done. It is best to take them out of the machine a few days before hatching and put them under a hen, so she can brood them later.

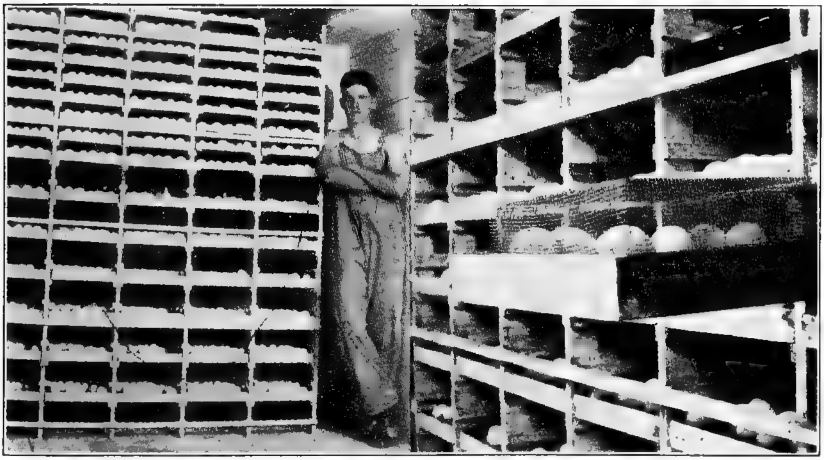
# The Story of a Machine of Creation

### Going the Ancients One Better

By Hiram H. Shepard.

Modern artificial incubation is not an original and exclusive trick of the moderns, but it was known and practiced by the ancients long centuries before America was discovered or Christ was born. The ancient Egyptians—who must be given credit for high advancement in the arts and sciences—hatched eggs in ovens thousands of years ago. And, by the way, the Egyptian brick oven incubators were giants along side of the average incubator of today.

What we commonly call "artificial incubation" is not necessarily artificial, but perfectly natural. Frogs' eggs by the millions hatch out in the even cool waters of ponds, marshes, and brooks. Snakes and turtles bury their eggs in the soil to be hatched out by a few degrees of heat furnished by decomposing vegetable matter. Potato-bug eggs hatch out by the tens of thousands on the under side of potato leaves in the ordinary atmosphere of May and June days, and they invariably give a high percentage hatch. Also, the baby bugs are strong, healthy fellows, thriving on a green diet and the blue sky as a hover. Nature does not coddle her broods as do poultrymen.

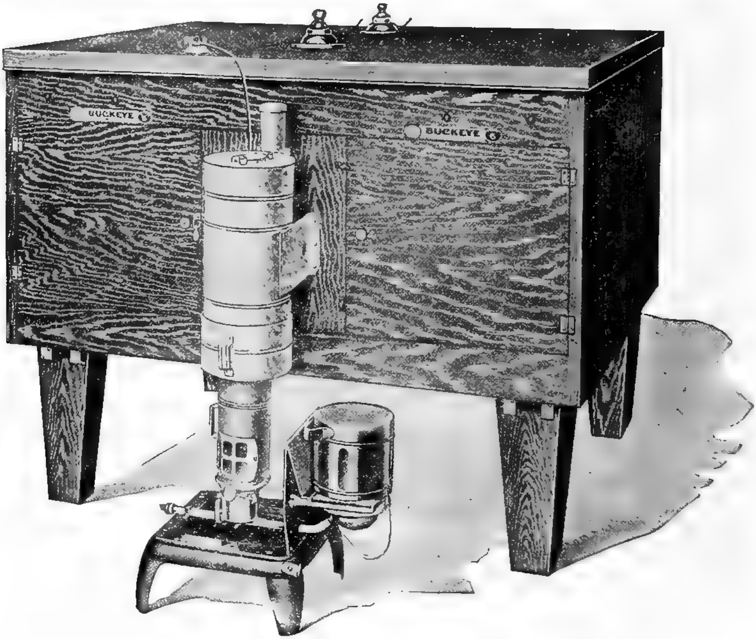


This shows two views, one on the right and one on the left, as seen in the large incubator of the Yesterlaid Egg Farm at Pacific, Mo. More than 200,000 eggs are incubated at one time in this machine.

Perhaps copying from Nature on the one hand and the ancient Egyptians on the other, Mr. Rolla C. Lawry, manager of the Yesterlaid Egg Farms Company, has built a big incubator that almost rivals Nature's frog and potato-bug hatching, and goes the ancient Egyptians a full country block better. It (his big incubator) is a veritable giant for hatching hens' eggs. It has a capacity—not for a hundred, nor a thousand, nor ten thousand, but more than a hundred thousand at a time. The limit of its capacity with extreme crowding of available space is close to two hundred and fifty thousand.

Just think of it! A fifth of a million or a quarter of a million of eggs in one incubator means a big and valuable lot of eggs to gamble on for hatching. Even a hundred thousand eggs is a big lot to consign to one artificial hen and risk chances of the hen going on a strike before the hatching time is up.

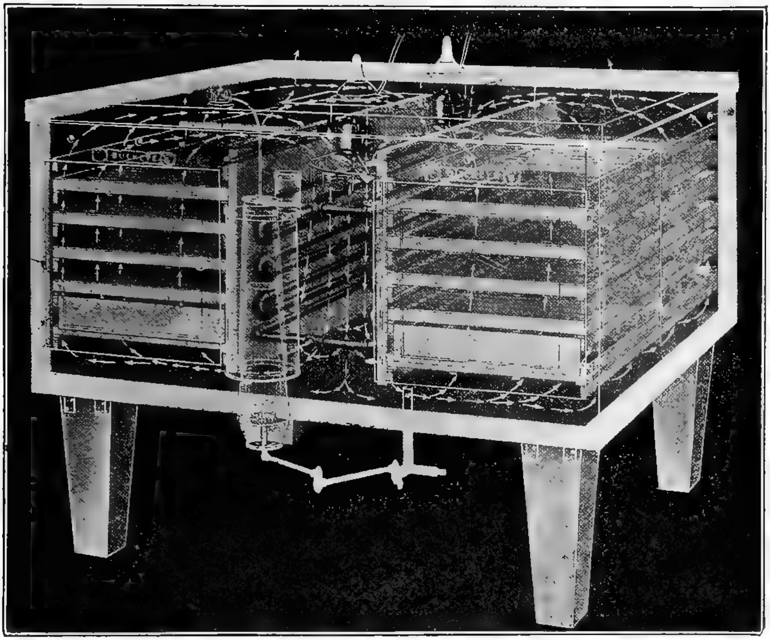
Figure it out and see what it amounts to. A hundred thousand eggs at five cents each, if I figure right, is exactly $5,000. To fill the big incubator to the extreme limit of its capacity would require an investment of some $10,000 to $12,000—more than the average poultry farmer is worth. Hence, it can easily be understood that a big incubator like Mr. Lawry has built and is now successfully operating is not a plaything for the amateur operating with a dozen hens in the back yard. It is a man's size machine, and not a child's toy. It is an incubator for the large commercial plant, although it will hatch pedigreed eggs as well as any kind. The handling of pedigreed eggs and special eggs of all kinds is accomplished by placing them in numbered trays with wire cloth lids or covers. In this way they can be kept absolutely separate from the thousands of other eggs and chicks in the same big chamber.



This shows the exterior of the 2,400-egg "Buckeye" Incubator. It also shows the heating device. This is a blue flame oil burner, and is very economical and easy to operate.

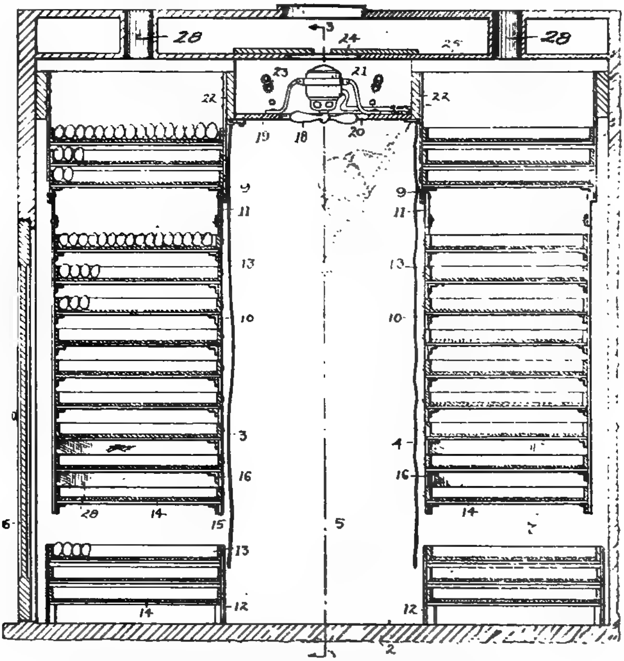
Mr. Lawry's giant incubator is nothing like any of the modern manufactured incubators. It is not a continuous unit affair, like the ordinary long multiple unit machine or a stack of sectional bookcases, nor is it a double, triple, or quadruple decked affair, such as some of the single so-called mammoth machines. It is simply one big room in a building heated and regulated to perfect artificial incubating conditions. It is as simple as A, B, C in many ways, and as complex as X, Y, Z in others; but, on the whole, original, a model of mathematical and mechanical ingenuity—and successful as an incubator, which is the highest merit of any make of machine. It hatches a high per cent of livable chicks.

Heating chamber, entrance vestibule, and incubator chamber are separated from each other by tight non-conducting walls and heavy insulated doors. The outside walls are 10 inches thick and made up of several lays of matched boards, felt paper, shavings, and other good non-conducting materials to make thoroughly tight and impervious walls. And the walls of the incubator are built inside the walls of the big concrete block building, resting against them on three sides. The room as a whole is built on the same principle as a refrigerator, retains heat and excludes cold, as the refrigerator retains cold and excludes heat, all of which is comparatively simple and commonly known.



The above is a cross section of a 2,400-egg "Buckeye" Incubator. You can see the hot water pipes running through the center of the machine, and there are two electric fans on top of the incubator. The darts shown in the photograph show the intakes of the air as it is forced in by the fans and after it passes around through the incubator and out again through the ventilating holes in the top of the machine. The temperature is kept at 100 degrees throughout the hatching, and the eggs are put in the top tray of the machine and moved down from time to time as the chicks hatch, and new eggs are put in. The hatch always takes place in the bottom trays. This machine is very compact and a large number of eggs can be incubated in a very small room.

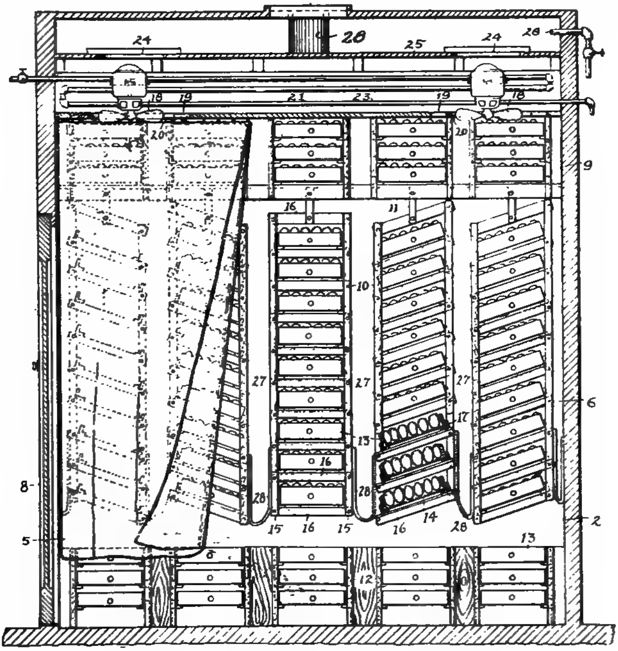
However, the internal workings of this big incubator are not exactly the same as that of ordinary large and small incubators. One novel and very convenient feature is that the attendants can walk and work inside the machine. In fact, all of the work of handling the eggs during the three weeks of incubation is done inside in the pleasant heat of about a hundred degrees—if you care to call such summer temperature pleasant. The room is lighted with electric bulbs for work. A small table on casters and a chair are the meager furnishings of the room. The testing device is of board construction, with holes, and lighted with an electric bulb. For testing eggs, the table is rolled under the device inside, a tray of eggs is slipped from the rows of cases holding them, placed on the table, and the attendant tests them "by the sweat of his brow," but it is good for the eggs. There is no chance for them becoming over-chilled, as is often the case where eggs are taken out of the incubator for testing. Likewise, all of the eggs are turned inside of the room, in no case being exposed to outside air. The attendant may be slow or fast in work; it makes no difference here, for everything—whether fast or slow—is done in a warm atmosphere. The big incubating room is heated by the hot water, forced air circulating system. The water is heated by a common strong gasoline burner, which is located outside the front wall of the room, convenient for attention, similarly to the position of a lamp on a small incubator. The hot water radiator is located in a small chamber to one side of the vestibule entrance. It is a tightly closed chamber. From it leads a hot air chute and into it a cold air chute. A fan, driven either by water or an electric motor, forces heated air out through one chute and draws the chilled air back through the other. A small opening, regulated with a valve, admits fresh air from the outside into the heating chamber, and valves or gates in the return chute regulate the amount of used over air to be returned and the amount to be thrown outside as waste or impurity. With the forced circulation and the valves regulating the amount and the rate of flow, the purity of the air of the incubating room can be perfectly maintained.



This shows an end view of the 10,800-egg "Buckeye" Incubator. The location of the egg trays and the electric fans in the top of the machine can be easily seen. The floor space occupied by this incubator is 7 feet 6 inches by 7 feet 10 inches, and the height is 6 feet 3½ inches over all. The machine really requires a room which is 12 feet square, in which to operate at best advantage. Where such a large number of eggs are confined to such a small space, it is absolutely necessary that the room be extremely well ventilated, and that you have some ventilation near the floor.

All who have used incubators know that the moisture in the incubating chamber is an important factor at times. Using the hygrometer for determining the amount of atmospheric moisture in the chamber of an ordinary incubator is of doubtful value, from the nature and working of the instrument. However, in a big room where you can go inside and work with instruments of this kind, the determination of moisture is easy and accurate. Mr. Lawry uses a sling psychrometer, which he whirls around in the air by hand, and which determines reliably at any time the amount of atmospheric moisture. Hence, moisture can be admitted at times when it is needed.

Another unique feature of this big unit incubator is the recording of temperature. For this purpose a clock self registering thermometer is used, which is a 24-hour clock with a revolving face that carries a paper disc upon which an automatic pen marks a line telling the exact temperature for every hour and fraction thereof for the twenty-four hours. These thermometer record discs are kept on file, and obviously are of great value for reference as a guide in determining the effect of possible heating causes of variance in hatches. The experienced incubator operator will readily appreciate the value of minute daily heat records for a hatch. Besides the one clock self registering thermometer, a number of ordinary small incubator thermometers are used on the filled egg trays and in various parts of the room. So perfect is the heating and heater air circulation, of this big incubator room that by repeated thermometer tests it has been found that the temperature does not vary more than one degree in any corner or part of the room at one time. The testing is simple, as a thermometer can be placed in any part of the room with ease and without disturbance of heat or circulation. Everything is done inside of the room.



This shows a front view of the Mammoth "Buckeye" Incubator, and also discloses the egg trays, both in horizontal and tilted positions. The tilting trays are so arranged that an entire tier can be shifted either way by one movement of the hand, thus turning all of the eggs quickly and easily. The weight and friction and balancing of the parts of the turning trays cause the trays to remain in any shifting positon, whether horizontal or inclined. This is, without a doubt, the most compact machine that is being built today in this or any other country.

The incubator is not filled all at once, but periodically, a new hatch being placed in every week, and hence a hatch taken off every week. Trays are held by frames surrounding the walls, and the trays are painted in different colors to distinguish different hatches of eggs. The taking in of a large new hatch of cold eggs makes no appreciable change of temperature in the big incubator, hence no damage to the eggs that have been in there from a week to two weeks or more. The interior arrangement is such that perfect sanitation can be secured; hence it would be possible and safe, if needed, to fill sections of the incubator every day with fresh eggs, and have hatches coming off daily. The machine can be run continuously from the beginning to the end of the season, and large or small orders for day-old chicks filled promptly at any time. They can be run out in a continuous stream, like meal at the mill.

The most startling feature of this incubator is its size. It is big. As the high school girl said, "It is awfully big—big as a freight car," and it returns about 800 chicks for every 1,000 fertile eggs placed in it. Only men and women of large constructive imagination and large faith plan, build, and operate big things. Mr. Lawry possesses large constructive imagination, and he must have faith to shove ten thousand or fifty thousand eggs at a time into a hot room and wait for them to be pipped. To the poultry lover, it is like visiting Niagara Falls to visit this plant and be taken inside this giant incubator to watch the attendants testing and turning eggs by the thousands, or taking day-old chicks out of the trays with both hands and placing them in shipping cases as fast as feeding fodder into a silo cutter.

If you wanted to hatch as many chicks as Mr. Lawry's incubator is capable of hatching at one time, you would need a thousand 120-egg machines, or ten thousand sitting hens. It all goes to show that the poultry business of our country is immense in size, and that men of genius are planning and working to make it the largest and richest of all our great American industries.

## A NEW IDEA IN INCUBATION

In the new Buckeye Mammoth Incubators eggs are tiered, one tray of eggs above another, from the floor to the ceiling. They are built in sizes of 2,400 to 660,000 eggs. The 2,400-egg size occupies a space of 4½ or five feet square. This permits a large capacity machine to be used in a small room or building. The 660,000 machine fills a building 65 by 110 feet.

The above is an interior view of the large Smith Hatchery at Cleveland, Ohio. On either side of the hallway are thousands of eggs, the incubator being built into the building and forming a part of same. This incubator holds more than 200,000 eggs.

Electric fans operate in the top of each section of the machine. This forces the warm air to all parts of the machine; therefore, the bottom of the egg is just as hot as the top. For this reason, the temperature is kept only at 100 degrees, instead of 103, and the chicks hatch in twenty-one days just the same. The room in which these machines are operated must be well ventialted. Another strange thing about these machines is that the manufacturers claim that it is not necessary to supply moisture or to cool the eggs. Under the forced draft system of incubation, the eggs do not require cooling. They recommend leaving them in the incubator continuously, except when taken out for turning and testing. Under no circumstances should the incubator be filled to full capacity on any one day. They must always be started at the top and always hatched at the bottom.

In writing of this machine the company manufacturing the same states:

"Despite our instructions to the contrary, we find that some of our customers are filling Buckeye Mammoth Incubators to their full capacity on the same day. There are four compartments in the 2,400-egg machine. If four trays are filled for this machine, one should be started at the top in each section, and not all put in one section.

"If you will refer to the paragraph entitled 'Operation' in your instruction book, you will note that the eggs should always be started in the top tiers and hatched in the bottom tiers. Our instructions clearly state that the eggs must be advanced toward the bottom from tier to tier as the incubation of each lot of eggs progresses; and unless this plan of operation is followed, it would be quite impossible to procure the maximum results.

"We find a disposition on the part of some operators to assume that their experience with other incubators makes it quite impossible to pay any particular attention to our instructions; and, while this might be all right in some cases, we cannot help feeling that it is a pretty risky thing to do with an incubator. The Buckeye Mammoth Incubator is fundamentally different from most other incubators, and we consider it highly advisable for every operator to be sure that the entire operation of the machine is in strict accordance with our instructions."

The Smith Standard Hatchery of Cleveland is built after the same plan. It holds forty tons of eggs at one time. The building is divided into twelve separate incubating rooms, or units, each of these rooms containing twenty sections of egg trays, arranged in twenty-two tiers each, in which are held the egg trays, each one of which is of 126-egg capacity. In other words, by multiplying 20 (the number of sections of egg trays) by 22 (the number of tries) and by 126 (the capacity of each tray), you have 55,440, which is the total capacity of each room, or unit.

The heat for incubation in generated by steam and is regulated and controlled by a specially designed metal thermostat. Ventilation is supplied by three electric fans in each room. These are regulated automatically at all times. All that is necessary for the operator to do is to supply the oil for lubrication.

No poisonous gases or bad fumes can accumulate in these incubator rooms, thus avoiding one of the greatest causes of weakness in chicks. Fresh air, poroperly administered, gives chicks, when hatched, the necessary strength and size. The moisture is provided by blowing in the proper amount of live steam, regulated by a specially designed controlling valve.

Dr. Smith, the inventor of this plan of incubation, recently wrote us as follows:

"We are putting these incubators on the market. We do not sell them. We rent them. We require a deposit of sixteen hundred and fifty dollars ($1,650.00) on each fifty-five thousand (55,000) egg machine and charge a rental of one cent ($0.01) for every chick hatched."

### MULTIPLE-DECK INCUBATORS ARE A NEW DEVELOPMENT

During the last year in an effort to make the long mammoth incubator more efficient and in an effort to economize space, the tendency has been to double and triple deck the long mammoth incubator. By this method of construction a great deal of floor space is saved and hence capacity materially increased. The ideal arrangement of this kind is probably a triple deck machine, the eggs being run for the first week on the top deck, for the second week on the middle deck and the eggs run and hatched the third week on the lower deck. This type of equipment works out advantageously where large commercial hatching is done, because it simplifies the routine of setting and taking off hatches. The upper deck of the machine can be set each week immediately after the lower deck hatches. Two problems which have had to be solved in building the Multiple Deck incubator has been ways of insuring adequate ventilation and secondly, suitable heater construction in order to provide a proper degree of temperature and proper circulation in all decks. The Multiple Deck Mammoth Incubator and the Cabinet Incubator of the Buckeye type have completely revolutionized the hatching egg industry in the United States to such an extent that there is a rapid development in commercial hatching and baby chick production. So marked that if it continues, in all probability this will be one of the largest branches of the poultry industry in America in a very short time.

### SIMPLE RULES FOR OPERATION

It is usually best to follow the rules sent with your machine. If you don't get a good hatch by doing that, then see if you cannot put into use some of the suggestions made in this lesson. The following rules usually improve the hatch and are applicable to almost any machine.

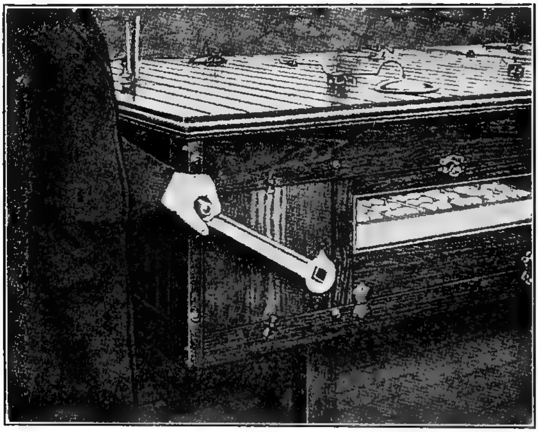
Do not keep hatching eggs over one week before setting them unless you are forced to do so.

Do not keep hatching eggs too warm, too cold, or where it is damp. Never permit them to sit for long periods in a bucket, basket or box on cold earth floors.

In late spring, or during dry weather, it always pays to keep eggs in a room where the air is cool and moist.

In sitting hens, change the litter, and thoroughly clean the nest on the tenth and again on the seventeenth days. At such times, also dust the hens for lice.

Test out the eggs under a hen in the same manner as eggs in an incubator.



A section of a Newtown Giant Incubator, showing the construction of the machine and a turning device so the eggs may be quickly and easily turned by the lever shown. Does away with hand turning.

Never set a dirty or soiled egg. Wash it first. But it is best never to wash them; therefore, produce clean eggs.

See that all eggs are from healthy stock of good size and shape.

See that the incubator is properly heated and regulated before placing eggs in it.

Do not turn eggs until forty-eight hours after placed in machine.

Always turn eggs in the morning and again at night; once at noon will do no harm.

Do not fill or handle lamp until you have finished turning or handling eggs, to avoid oil from hands getting on eggs.

Always fill lamp each morning regularly, cleaning wick by rubbing over same with small cloth wrapped about finger, after turning wick down even with burner.

Do not cut or trim wick with shears. This causes flame to be uneven. A new wick is best adjusted to a desired square flame by first placing it in the burner and after turning down to about one-eighth of an inch, char it over by lighting it. This burns off the uneven portions, and starts the flame even at the beginning.

Always use a new wick for each hatch.

Always boil burner in sal soda or laundry suds after each hatch.

Do not start a new hatch in machine until the inside is washed from any stains or dirt, and disinfected.

Do not cool eggs until the end of the first week.

It is not necessary to cool eggs but once a day, preferably in the morning, while taking care of the lamp.

Do not cool too fast—a room at 65 degrees is most suitable. See that the eggs feel slightly warm to the naked hand. Allow more time each day, but still use the eye test until you become accustomed to the right temperature otherwise.

Do not allow eggs to ever become cold. This weakens the germ.

Hands should always be clean and dry when hatching eggs are handled.

Eggs should be aired, cooled, and turned longer and more often after the tenth day.

Test out all infertile eggs not later than the ninth day. Always test out the eggs containing dead germs not later than the fourteenth day. Dead germs cause the air in the incubator to have a bad odor.

More hatches are spoiled or cut down, and more chicks die in the shell, through lack of moisture than from too much moisture.

Always start the hatch by having the flame of the lamp reasonably high, allowing some surplus heat at the start of the hatch to escape from the regulator, thus giving the operator a chance to gradually reduce the flame as the hatch proceeds, and not have to readjust the regulator or finally be compelled to take out the lamp, along at the last, in order to hold the heat down.

Do not readjust regulator during hatch. It should be set to just raise disk at 103 at the start, with usually a moderately high flame,—and, thereafter, adjust the flame for the necessary amount of heat, instead of regulator.

Do not change lamp flame or regulator just before retiring—always do any necessary readjusting each morning, or at least two hours before retiring, that the desired heat may properly be known at that time and so remain during the night.

The best results can be obtained by applying moisture direct to incubator during the hatch. If in a dry room, keep floor beneath machine constantly moistened or sprinkled.

Do not turn or cool eggs after the last of the eighteenth day.

Duck eggs should be thoroughly wet twice each day after the seventh day, and once each day before that.

Turkey eggs should be lightly sprinkled once each day from the seventh day on.

If wire covered pedigee hatching baskets are used, on and after the eighteenth day care must be taken to readjust the regulator to permit two or three additional degrees of heat at the same time.

Remember, if chicks are removed from the machine during the hatching period, you are removing just that much animal heat; thus additional heat must be provided.

Do not open door of incubator while eggs are hatching, as this allows a draft on the eggs and sometimes causes a poor hatch.

Do not allow chicks to drop suddenly from egg tray into a much cooler nursery. Better wait until hatch is completed and then place them all down and remove egg tray so that more heat can get to them, thus not chilling them, and so avoid ailments, such as bowel trouble, and so forth.

Do not remove chicks to brooder until all are up, lively, and thoroughly dry—usually from twenty-four to thirty-six hours.

Never allow the baby chicks to stand on a board or metal floor as long as they remain in the machine. Cover the floor with burlap or something which will give the chicks a chance to hold with their toes.

Feed green food with open runs, corn food only at night, and not too much; but it must be understood, from baby chicks on, a sudden change in the feeding does more harm than good.

Do not fuss with the incubator. See that the regulator is set correctly, and then let it alone. Do not be continually fussing with it, turning it up and then down. The variation of the heat, either up or down, of a few degrees will do no harm, if not allowed to remain long. Watch the lamp about fifteen minutes after filling, and if it is going all right, let it alone, unless there is a great and sudden change in the surrounding atmosphere. Do not open the door of the incubator except when turning the eggs. Fix the thermometer in some way that it can be seen without opening the door.

Just so with the hen; avoid fussing with her. Look at the eggs when she comes off for food, and if they are all right, leave her alone.

Stop turning the eggs the eighteenth day and leave the door shut.

While hatching, leave the chicks severely alone. Do not let your curiosity make you spoil the hatch; for the continual opening of the door allows the warm, moist air to escape, and the membrane surrounding the chick hardens, and the chick is unable to make its way out, and dies in the shell.

## POST-SEASON CARE OF THE INCUBATOR

Whether an incubator will prove to be long or short lived depends in a large measure upon its care between the hatching seasons. As soon as the last hatch has been taken off, the machine should be thoroughly cleaned, disinfected, and dried out. If a hot water machine, the tank should be carefully drained. Special attention should be given to the lamp and heating apparatus. Empty out the oil. Throw away the wick, and boil the burner in a strong cleansing solution. If there are any metal parts that are liable to rust, wipe them with an oily rag. Then store the machine in a dry place and it will be ready for service again the following spring, practically as good as new.

## QUESTIONS IN INCUBATION

### Lesson No. 17

1. What are some of the differences between hot air and hot water incubators?

2. What three things determine or influence the amount of evaporation of the contents of an egg in an incubator?

3. How would you determine whether more or less moisture was needed? And what would be the best method of supplying it?

4. During which period of incubation does the embryo require the most blood, and, therefore, the most oxygen and best ventilation?

5. Why are the eggs turned, and how often should they be turned?

6. How and when should eggs be cooled? How and when tested?

7. Why is it necessary to test eggs?

8. Why should the incubator door be closed and darkened at hatching time?

9. How long should the chicks be left in the incubator before they are removed? Why?

10. How should the incubator be cared for between seasons when not in use?

# Natural and Artificial Brooding

By T. E. QUISENBERRY

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After the breeding stock has been properly selected and mated, after the eggs have been properly handled and graded, after incubation has taken place and the chicks have hatched, the next important question to consider is the brooding. Shall it be by natural or artificial methods? Shall I use fireless or heated brooders? Shall I use adaptable or adjustable hovers, or shall they be portable? Shall I use indoor or outdoor brooders? Would brooder stoves or a mammoth brooding system be best for my use? These are important questions to be considered. The kind of brooder and size of brooder would be determined largely by the number of chicks I expected to raise and by the building room or coop in which I proposed to raise them. Simplicity, economy, durability, convenience in operation, and that brooder or hover which approaches nearest to fool-proofness, would be the best brooding system for any poultryman to adopt.

FIG. 1. READY FOR THE BROODER

Beyond any question, brooding is one of the poultryman's big problems, especially if he raises poultry on a large scale. One man recently wrote us that he had no trouble in hatching 2,500 chicks this season, but in less than one month had fewer than 50 chicks left from the large number hatched. If you have a good incubator, you will experience but little difficulty, as a rule, in getting a good hatch, but the most failures come when you attempt to rear them.

The real test of the merits of any brooding system is its suitableness or fitness for raising chicks under the most unfavorable weather conditions. Almost any brooder or hover will do reasonably well when the days and nights are mild and pleasant. When chicks can not be let out for days at a time during the cold, damp days of early spring, this is when the real test comes. If they have to be confined day after day, and are thus confined without proper ventilation and exercise, and with great variation in temperature, this is when we have the greatest per cent of mortality.

Any brooding system which does not provide for plenty of room for exercise so as not to retard the growth and development of the chicks, is sadly deficient, in my opinion. If there is any possibility of a variation in temperature on the part of the brooder heater, then there should be sufficient room so that the chicks may be allowed to make their own choice as to the distance they may remain from or as to their closeness to the heat.

The subject of brooding, especially artificial brooding, is one of vital importance to every person who desires to succeed in the poultry business. Even though you are thoroughly versed in every other phase of the business, failure is certain unless you master, to its minutest detail, the subject of brooding.

With the recurring of each spring season you take your life in your hands, so to speak, when you set out to renew your flock and produce stock for the following season's trade. Your whole future depends upon your ability, not only to raise a large per cent of the chicks hatched, but to raise them so that they will grow rapidly, develop normally, and at a reasonable cost.

The necessity of thoroughly mastering this subject has been well summed up as follows: "It has been estimated that of every one hundred chicks that die as the result of some form of bowel trouble—scours, diarrhea, gumming-up, etc., 50 per cent die on account of improper brooding, from overheating or chilling, and that 30 per cent die on account of incorrect feeding. Inasmuch as 80 or 90 per cent of the total number of small chicks that die are lost as the result of bowel trouble in some form, it may be seen at once how very important is the question of proper brooding."

When all of the problems relating to artificial brooding shall have been solved; in other words, when chicks can be raised in large numbers artificially, and at the same time just as well and just as surely as the old hen can raise a few, the greatest obstacle to the rapid advancement of the industry will have been removed.

## ADVICE TO THE BEGINNER

We believe it is unwise for the beginner to invest too much in a brooder house and brooding system until he has gotten some experience and some knowledge of the different systems. He should determine what is best suited for his conditions and his purposes before investing too much or attempting things upon too large a scale. Portable colony houses, fitted with movable or portable hovers of some description, may be used temporarily, and mammoth brooder stoves or brooding systems installed as soon as the location of the brooder houses and the kind of system to be used is fully determined.

## ARTIFICIAL BROODING

More rapid progress has been made in recent years toward a solution of our brooding problems than in almost any other line which affects the rearing of young chicks. All systems are still somewhat defective, but we believe that, with a good brooding system, we can raise equally as large a per cent of chicks as can be raised by natural methods. If chicks are to be raised in large numbers, we are obliged to depend upon artificial methods To brood 5,000 to 10,000 chicks with hens would be a very expensive and cumbersome undertaking. The small amount of net profit made from any one fowl forces us to raise and deal with a large number of individuals if we are to make much out of the poultry business, as a business. A farmer can take a few hundred chicks and a small flock of hens, and, if properly managed, the greater part of the income from such a flock is clear profit to him. But if we exceed the numbers and the volume of business done by the average farmer and poultry-raiser, we are forced to use artificial methods. Which system is safest and best? That is the problem.

The problems of artificial brooding have for years baffled the skill of the poultryman, both beginner and "old-timer." It has seemed impossible to construct an artificial hover or brooder that would take the place of old Biddy. The chicks get too hot or too cold. They crowd in the corners and smother each other. They contract complaints and ills of various sorts. To quote one discouraged poultryman: "They just seemed determined to die."

As a result it came to be the general consensus of opinion that, while almost anyone could hatch chicks in an incubator, it takes an expert to raise them in a brooder.

In this, as in other lines, however, American genius refused to suffer defeat. Improvements in brooder construction were made from time to time, new principles evolved, new methods put into practice, until today tens of thousands of chicks are being successfully raised artificially, where before hundreds were raised with difficulty.

**Exit the Box Brooder**—The old-fashioned wooden box brooder, usually heated with a kerosene lamp, while it was better than nothing and served as a stepping stone to something better, in many instances proved to be a veritable death-trap. They were sensitive to outside changes in temperature and difficult to regulate to suit the needs of the chicks. Ventilation was usually poor the air often becoming so foul as to be very harmful. If the brooder became too hot, there was no escape for the chicks, until a kind Providence put them out of their misery. Small wonder that the amateur poultryman often decided that the chicken business was not what it was "cracked up to be!"

During the past few years, however, a new style of brooder has been evolved, which largely does away with the troubles above enumerated. We refer to the portable sanitary hover, several styles of which are now manufactured by the various incubator companies. The bodies of these hovers are made of galvanized iron, thus rendering them fire-proof. They are circular, so that there are no corners in which the chicks can crowd. The heat is applied from above, just as it is by the mother hen. The body of the hover is raised about four inches off the ground, a curtain extending entirely around it. The chicks hover underneath. If they get warm, they stick their heads out between the flaps of the curtain. There is no overheating no overcrowding and piling up. The conditions are almost ideal.

These portable sanitary hovers can be easily and quickly moved about. They can be used anywhere—in a box, shed, colony house, or room. They fill a long felt want on the part of the average poultryman, and their use insures a larger measure of success than was formerly possible.

With the problems of artificial brooding successfully solved, it can be safely predicted that the poultry industry will witness a development beyond the fondest dreams of even the most optimistic. The population of our cities is increasing three times as fast as the population of the country. The people must all be fed. Beef is scarce, and growing daily more scarce and high in price. Poultry and eggs offer the best substitute. They are both palatable and nutritious. By employing modern methods of artificial incubation and brooding, chicks can be successfully and profitably raised in large numbers—and there is no danger from over-production. It will be readily seen that the large commercial egg farms, upon which thousands of laying hens are kept, and the market poultry plants in which thousands of broilers are produced each season, would be physical impossibilities if these chicks had to be hatched and brooded with hens.

Surely the men who perfected our modern methods of artificial incubation and brooding are entitled to be known as public benefactors.

## ESSENTIALS OF A GOOD BROODER

The ideal brooder is the one which provides ideal living conditions for the chick at the least cost and with the least possible amount of care and labor. In order to do this, several requirements must be complied with.

**Temperature**—The first essential of the ideal brooder is that its heating plant shall be able to produce abundant heat even in the coldest weather, while 100 degrees is as high a temperature as it is usually necessary to maintain, yet the heater should be capable of maintaining a temperature of 110 degrees in severe weather if it should be required.

The heater should not only be able to produce abundant heat, but the heat should be regulated and controlled just as it is in the incubator. A proper and uniform temperature is especially important during the first two weeks of the chick's life, and thousands of deaths have resulted from the lack of it.

**"Safety First."**—Next to the requirement of being able to produce abundant heat is the requirement that this heat shall be produced safely. Tens of thousands of chicks and thousands of dollars' worth of property have been lost on account of cheaply constructed brooder heaters.

**Fresh Air.**—The third requirement of the ideal brooder is that it shall deliver a constant and abundant supply of warm fresh air to the chicks while they are hovering. Oxygen is as vital to the welfare of the chick after it is hatched as it is during the period of incubation. Heat alone is not sufficient; the air which the chick breathes must be fresh, as well as warm.

**Cool Apartment.**—A cool apartment that the chicks can always have access to is as important as a warm one. Few, if any, chicks would survive if they were constantly subjected to a temperature as high as that under the hover. The cooler apartment toughens them, makes them stronger and more vigorous, and helps to prepare them for the time when they will have to get along without artificial heat.

**Dryness**—Dampness is fatal to poultry, either old or young. It is especially deadly to little chicks, however, because of their delicacy and inability to withstand unfavorable conditions. Not only should the outdoor brooders be water tight and located in a dry place, but the litter should also be kept dry, and some method of watering the chicks should be provided so they will not get themselves wet while drinking.

## PREPARING THE BROODER FOR THE CHICKS

The brooder should be started when the chicks begin to hatch. This will give you about forty-eight hours to get everything in readiness, and the heat properly regulated. It is certainly unwise to put the chicks into any brooder until you have tried it out and know that the proper temperature can be maintained.

**Starting the Lamps**—To avoid danger from smoking and insure a steady heat, you should use the best grade of kerosene, just as good as you use in the incubator lamps. Whether the lamp is new or old, pay careful attention to the wick before lighting it. See that it is cut straight across the tube and that no loose threads are attached to it. Each corner of the wick should be cut off, so as to give a rounding flame. Light the lamp, put on the chimney, and if the blaze is not nicely rounded and free from flaming points, blow it out and do the job over again. If you are careful to have a nicely rounded blaze each time you trim the wick, and do not turn it over medium high when first lighting, you will rarely be bothered with the lamp smoking.

**Regulating the Temperature.**—After you are satisfied that the brooder is thoroughly dry, after disinfecting, close it up and you are ready to begin the important task of obtaining and maintaining the proper temperature. Inasmuch as the temperature in the incubator at hatching time is about 104 degrees, the temperature in the brooder where the chicks hover should not be over four or five degrees lower than that when the chicks are first put into it.

## PROPER TEMPERATURE FOR THE BROODER

Never remove your chicks from the incubator until they have been hardened off, and not until you are certain that the brooder heat has been properly regulated. Have the floor littered and the temperature regulated to the proper degree before transferring the chicks. If it is any distance from the incubator to the brooder, it is best that you use baskets and cover the chicks over with cloth to prevent them from chilling.

We prefer to have the brooder temperature range from 90 to 100 degrees for the first week. We would prefer to have it 100 for the entire week rather than ever allow it to drop to 70 or 80 degrees during that time. If you have sufficient room and plenty of ventilation in your brooder or brooder house, the chicks can get away from the heat and they will look out for their own comfort. But if the heat drops too low and they once get chilled, they are never able to entirely recover from it. Of course, if the heat goes extremely high and there is no room for the chicks to avoid it, this is equally as bad as chilling. As the chicks grow older the temperature is gradually lowered until they are old enough to do without heat entirely.

The contentment and comfort of the chicks themselves is the best indication of the proper temperature. However, we also use a thermometer. We place the thermometer in such a position that it is about level with the backs of the chicks, and about six to ten inches away from the center of the hover.

If the chicks stand with their mouths open, they are too hot. If they pile up in a big huddle, you can depend upon it that they are too cold. The heat is just right and the chicks are comfortable if they have their bodies tucked back under the hover and their heads peeping from under the cloth. When they are comfortable they rest with their bodies flattened, and their heads resting upon the floor, like sheep at rest upon a hillside. We prefer to have a little too much heat, rather than not enough.

Students of artificial brooding are by no means a unit as to brooding temperatures. The very fact that they are not agreed on this point indicates that the matter of temperature is not as imporant in brooding as in incubation. That is, a variation of a few degrees is not a matter of grave importance, provided the chicks are kept warm enough. A chilled chick is a dead one, nine times out of ten.

One reason why the temperature does not need to be so exact in brooding is that, with the hatching of the chicks, individuality begins to assert itself. Some chicks do not require as much heat as others. The stronger they are the more heat they generate themselves, and the less artificial heat they need. This is another reason why the round hovers are a success; they allow the chicks to select the temperature which suits them best.

In order to determine what the best brooding temperatures are, a very interesting and valuable experiment was recently conducted at the New Jersey Experiment Station. The experiment was conducted with four groups of fifty chicks each. With the exception of temperature, they were fed, cared for and brooded under exactly the same conditions.

The first brood was subjected to a high temperature, the average for the first twenty-eight days being 112 degrees under the hover. Forty-two per cent of this brood died during that time.

The second brood was not subjected to as high an average temperature, it being 104 degrees. The variations in temperature, however, were much greater, ranging from 86 to 120 degrees. The result was an even higher mortality than occurred in the first brood, 68 per cent of the chicks dying during the twenty-eight days.

The third brood was subjected to an average temperature of 94 degrees. There were no extreme variations, however. They were started in at a temperature of 100 degrees. This was gradually reduced, during the twenty-eight days, to 84 degrees. Only 10 per cent of the chicks in this brood died during the experiment.

The fourth brood was started in at a temperature of 90 degrees. This was gradually reduced to 74 degrees at the end of the experiment. Twenty-four per cent of the chicks in this brood died, the mortality being nearly two and a half times as great as in the third brood.

The results of this experiment, together with the experience of many successful poultrymen, indicate that for the first week a temperature of approximately 100 degrees is best, with 96 degrees for the second week, 92 degrees for the third week, and 88 degrees for the fourth week.

The above figures shoudl not be taken as a definite rule. The best rule is to watch the chicks. You can tell whether they are comfortable or not. If they hunt the warmest spot, and are inclined to bunch up, the temperature is not high enough, regardless of what the thermometer may say. On the other hand, if they seem to be seeing how far away from the heat they can get, or are seen with beaks open and wings held out from the body, they are uncomfortable. When the chicks are perfectly comfortable, they will scatter about on the floor of the brooder, usually lying prone on the floor with necks outstretched.

As the chicks grow and feather out, they both generate and conserve an increasingly larger amount of heat. The aim should be to keep them comfortable, yet reduce the artificial heat as rapidly as possible. The season of the year has much to do with this matter, also the variety of the chicks which are being brooded. The Leghorns, for instance, are all feathered out before some of the other varieties have begun to think about it.

In early spring the weather is sometimes so mild that chicks three weeks old will not require artificial heat. It should always be handy, however, for use in cold snaps. Not until they are fully feathered out, or all danger of sudden cold snaps has passed, should the means of furnishing artificial heat be taken away.

## PROPER LITTER FOR THE BROODER

Care and good judgment should be used in the selection of the first litter used upon the floor of the brooder. The newly hatched chick is a very inquisitive little creature, and oftentimes does foolish things about its eating and selection of food until it has sufficient time to learn the good from the bad. For that reason, it is best, as a rule, to use litter at first so that if the chick does eat quite a quantity of it, no particular damage can be done. Many chicks are killed by the use of shavings which contain a lot of sawdust. We prefer the use of sand, clover chaff, shredded clover or alfalfa, or straw cut in short lengths. Whatever may be used, it must be free from mold and must, or decayed particles. The bedding material should be short and not too coarse, so as to encourage the chicks to scratch and exercise. Dry chick feeds may be thrown into the litter to compel exercise.

When the weather is cold, it is important that the floor be well littered. The portion of the floor where the hover is located should be covered with sand.

Good clean earth should be kept in one corner or over a portion of the brooder floor. The chicks enjoy working in the earth; it absorbs the dampness from the droppings and is a good disinfectant.

## SANITATION

Sanitation, so far as the subject of brooding is concerned, has to do with the maintenance of a healthful environment for the chicks from the time they are hatched until they are mature.

Possibly it would be technically more correct to say that it has to do with the maintenance of an environment in which disease germs can neither multiply nor be transmitted from chick to chick. There are several essentials to the preservation of such an environment. Let us consider them in turn.

**Pure Air**—Oxygen is fatal to all germ life, and vital to the welfare of the baby chick. Pure air contains oxygen; the purer the air, the larger the proportion of oxygen. Thus the importance of pure air in chick sanitation becomes at once apparent. This appears the more true when it is known that many kinds of disease germs travel in foul air; it thus becomes a dangerous agent in the spreading of contagious disease.

Ventilation is necessary in hover or brooder in order to carry away the foul air from which the chicks have taken most of the oxygen and placed carbonic acid gas in its stead. A never failing supply of pure air must take the place of the foul air. The matter of proper ventilation is discussed further elsewhere in this lesson.

**Cleanliness**—That "cleanliness is next to godliness," is certainly true in caring for young chicks. Filth is the natural habitat of germs. Do away with filth in every form, and you have gone a long way toward abolishing danger from germ diseases. Not only should the chamber where the chicks hover at night be scrupulously cleaned daily, but the brooder itself should be placed where the surroundings are clean and sanitary. Remember that it is impossible to provide pure air where the air, in circulating, comes in contact with filth of any kind.

**Dryness**—Dampness is detrimental to adult fowls, but it is almost fatal to little chicks. Disease germs thrive in damp places. Special pains should be taken to see that the brooder is placed in dry surroundings, also the interior of the brooder, especially the litter in which the chicks scratch. Feel of it daily and change it at the first signs of dampness. Arrange the watering devices so that the chicks can not wet themselves or spill the water into litter in which they scratch.

**Light**—Light is not only an essential to sanitary conditions, but it is as necessary to the growth of chicks as it is to the growth of plants. They simply can not live without it. Sunlight has been spoken of as "Nature's disinfectant." It is sure death to all kinds of germs and vermin, and keeps the surroundings of the chicks dry.

In connection with artificial brooding, however, sunlight must be used with great discretion, especially while the chicks are quite young. It is dangerous to place the chicks where they will be subjected to the direct rays of the sun, especially through glass. The passing of the sun's rays through glass seems to intensify them so that they have an ill effect upon the chicks. Again, when the chicks are so young that they have not learned thoroughly to go to the hover to get warm, they will often huddle in the sun, and later become chilled when the sunshine vanishes. Either no direct sun should be allowed to shine in the runs, or else they should be so flooded with it that there will be no sunny spots in which the chicks will congregate.

## NUMBER OF CHICKENS IN ONE FLOCK

This varies and depends entirely upon the style of brooder or hover you expect to adopt. It was claimed for many years that not more than fifty chicks should be kept in one flock or one hover. This has been demonstrated to be entirely untrue. In all parts of the country, we see methods of brooding where 250, 500 and 1,000 chicks are being kept in one room. Many of the mammoth brooding systems have been improved until they work successfully. It is perhaps true that the average person, the inexperienced amateur, might do better with fewer chicks kept in smaller flocks. But it is a fact, that such great improvement has been made by brooder manufacturers in the past few years that many of the more dependable mammoth systems will prove a success, even in the hands of an amateur. If you expect to raise chickens in large numbers, you should investigate and adopt some system whereby you can brood the greatest number of chicks with the least expense for labor and equipment, and which will enable you to raise the greatest number of chicks with the least mortality.

Many poultry raisers claim that 100 chicks should be the maximum number of any one flock, but experience has shown that several times this number can be kept in a single nursery flock. We start them in large flocks, and when they are a few weeks old, are feathering nicely, and know how to take care of themselves and to look after their own comfort, they are then divided into flocks of about 200 and placed in portable colony houses where they can get plenty of range and fresh ground and tender green food, bugs and worms. It is true the larger the flock, the more hazard, as a rule, and the more experience which is required, more attention to details, and the more common sense which must be applied.

Where 1,000 or less chickens are produced on a farm annually, we recommend the use of some system with hovers or brooders holding from 50 to 250 chicks. If you expect a yearly production of 1,000 to 50,000 chicks annually, then we recommend the use of some sort of mammoth brooding system. But little more time is required in caring for a flock of several hundred than for a flock of less than a hundred. Even if the mortality is a little greater with a mammoth brooder, the saving in labor offsets this.

## DISINFECTING THE BROODER AND HOVERS

Before refilling the brooder or hover, certain precautions are necessary. The hover should be disinfected occasionally, perhaps once a week or every two weeks at least. If there is burlap or cotton flannel or other material surrounding the hover, this should be replaced with a clean piece once each year. Occasionally the brooder or hover should be scalded or washed out with a weak solution of creolin or zenoleum in warm water or other antiseptic solution, and thoroughly aired and exposed to the sun. This should be done at least once or twice during the season. Cleanliness is next to godliness in the poultry business. This practice discourages lice and kills any disease germs which might be lodged in the cracks and crevices. After scrubbing and disinfecting, the brooder or hover should be thoroughly dried out before the chicks are placed inside.

After the season is over, every brooder and hover should be thoroughly cleaned, the lamps emptied, the stoves cleaned, and everything stored away and made ready for the next season. You can save both time and money by giving some attention to the proper care of your brooders and hovers each season.

## PURPOSE OF ILLUSTRATIONS

The purpose of the illustrations in this lesson is not to advertise any one brooder or any one method. We give them for the reason that if you are to successfully brood chicks, it is important that you know something about each method and something about the principles involved in the construction of each brooder. You should study the illustrations as well as the text.

## FOLLOW MANUFACTURER'S DIRECTIONS

We advise you, in trying out any brooding system, to follow the manufacturer's directions exactly as given. If it is a reliable firm, they have tried their systems under varying conditions, and they ought to know best how the system should be installed and operated. We often fail to get the best results by depending too much upon our own ideas as to how to operate a brooding system. After you have given it a thorough trial as the manufacturer directs and the results are not satisfactory, then it would be well to try to improve the arrangement or method of operaion. This can sometimes be done to advantage; but at first, at least, it is best to follow strictly the direction of the manufacturer.

## FIRELESS BROODERS

Two or three years ago fireless brooders had a "boom." They were proclaimed a general panacea for all the troubles usually encountered in the artificial brooding of chicks. The popularity of the fireless brooders seems to be waning at the present time, however, simply because it has been shown that they can not be satisfactorily used under all conditions.

The newly hatched chick, just coming from a temperature of 103 degrees is a wonderfully sensitive little animal. Let it once get chilled, and its days are numbered. Nothing else is so sure a cause of the fatal bowel trouble. For this reason, unless the weather is mild and the temperature steady, some artificial heat should be supplied to the young chicks until they have had an opportunity to gradually get used to a cooler climate.

The logical place for the fireless brooder is as a supplementary hover, to be used in connection with heated hovers or brooders. Unless the weather is exceedingly severe and the building very cold in which the chicks are kept, the chicks can be moved from heated brooders to fireless brooders when they are three weeks old. Where this is done, the temperature of the heated brooder should be gradually lowered, so that when the change is finally made, the contrast will be scarcely noticeable. Otherwise, even at the age of three weeks or more, serious results are liable to follow the transfer.

The theory of the fireless brooder is to conserve the natural body heat of the chicks and use it in keeping them warm. To conserve this heat and at the same time provide sufficient fresh air is something of a problem, for the fresh air must be brought to the chicks in such a way that there will be no direct draft upon them.

It will be readily seen that the theory will not "work" when the weather is cold and the chicks are very young. Under such conditions, unless some artificial heat is provided, the chicks will pile up and smother in their efforts to keep warm.

Nature never intended that chicks should be brooded by the fireless or heatless method.

A hen's body temperature is 106 degrees or over, and it could hardly be expected that as tender a thing as a baby chick should be put in a box and expected to generate enough heat for its own body comfort. A mature man in a dry house and well clothed is still uncomfortable without fire.

You must remember that a baby chick is just out of an incubator with a temperature of 103 degrees, and it certainly can not be immediately transferred to a fireless brooder and get the best results, as a rule. However, if a heated brooder is used, the chicks should have space enough so they can get away from the heat when they become too hot.

## WHEN CAN WE USE FIRELESS BROODERS?

It is an easy thing to tell how to raise chickens, but it is a much more difficult thing to successfully raise them. Books are being published and schemes advanced whereby fabulous sums of money can be made in the chicken business, and they picture it is as one pleasant dream, and they tell you that if you pay them fifty cents or one dollar to tell you how, your fortune is assured. There are some good ideas advanced in almost all of these schemes, but if you attempt to put into practice all they advocate, you will land in the "poor house."

Just which brooding system is the best is difficult to say. Some are succeeding with one system and others fail with the same system. Some of the incubator factories are making good brooders, but some are more or less unsatisfactory. Many are using fireless brooders. The best chickens we ever raised were kept in a shoe box with a jug of water in the center, and a cloth to come down and touch their backs. You can do away with heat of any kind, so long as you confine the chicks in small quarters at night and keep sufficient covering over them so they will be kept comfortable by the heat of their own bodies. In cold weather the chicks must be given some heat or kept in a comfortable place until they are a week old or more before they are transferred to the fireless brooder. A room can be heated to 60 degrees in the day time and to 40 or 50 degrees at night, and these fireless brooders work successfully in such a temperature and at less cost than a building can be piped and equipped for hot water or other methods of brooding. By putting a stove in the center of a large room, these fireless brooders or hovers work very successfully in some cases.

If you expect to raise only a few chickens on a city lot, or if you have nothing else to do except to fuss with chickens, then you might use fireless brooders. We do not recommend them to people who expect to raise hundreds or thousands of chickens and who have to make every cent count. With some of the better systems of brooding that we have today, all you need to do is to feed and water the chickens, clean the hover, and put in a little fuel occasionally. One man can brood thousands successfully with some of the best systems, while it would keep him busy brooding a few hundred with the fireless brooders. As stated before, they are all right for people who expect to raise only a few or who have lots of time to devote to putting the chickens in the hover every time they become a little chilled.

**A Cheaply Constructed Indoor Fireless Brooder.**—The fireless brooders have some things to commend them to our favor. There are no heater pipes to bother with, no lamps to fill or to smoke, no hens to fuss with, and no head or body lice to injure the young chicks and they can be raised by this method when these brooders are kept in a colony house, brooder house, or in an ordinary shed or out-building, so that the chicks will be protected from severe cold rains. They can also be used for midwinter brooding, if you have a house so arranged that the temperature will not be below freezing, the theory being on the same principle that you are kept warm while in bed, on a cold night. These brooders can be built out of ordinary lumber, and should not be made larger than two by three feet, perhaps eighteen inches or two feet square being the best size. The box should be made about ten incnes deep. We make a light frame just the proper size to fit the inside of this box, and tack a piece of heavy cotton flannel so that it will hang loosely on the underneath side of this frame. When the chicks are small, this frame is lowered on the inside of the box until the cloth touches the backs of the young chicks, and this frame can be held at the proper height by tacking small nails on the inside of the box. Tack the cloth to the frame

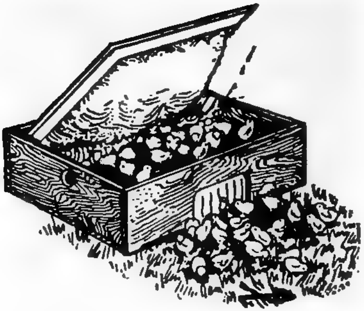


FIG. 2
INDOOR FIRELESS BROODER

in such a manner that it will sag in the center. Over this frame which is covered with cloth we place two little comforts, made as follows: Take an ordinary piece of cheese-cloth and cut it the proper size to fit the box. We take two pieces of this cheese-cloth and fill it with cotton batting and then tack it as we would an ordinary comfort. Make at least two of these little comforts for each fireless brooder, and on very cold nights it may be necessary to use as many as three of these comforts. In ordinary cold weather use two, in mild weather use one, and in warm weather you will need nothing except the frame which is covered with the cotton flannel. Less than twenty-five chicks kept in one of these brooders will not keep comfortable, should the weather be very cold. They will brood twenty-five to fifty chicks very successfully. Cut an opening in one side of the brooder large enough to allow the little chicks to run in and out, and at night, or when the chicks seem uncomfortable, they should be shoved into the brooder and this opening closed. Make a board floor just to fit the inside of the brooder, but do not nail it or attach it to the brooder. Should this floor have a tendency to become damp, it may be covered with rubberoid roofing or some other material of that description. Keep a lot of chaff or litter over the floor of this brooder, and one or more of these can be placed in any shed or building, and I am sure they will give reasonably good results. We prefer the ordinary comfort or cloth top to a top made of boards, and the comforts used over the chicks at night have proven more satisfactory by experiment than the board roof. For the first few days, it is advisable to place a little one-inch mesh poultry netting around this brooder, so the little chicks can be let out upon the floor or ground and still be kept close to the brooder until they learn their way in and out and become familiar with the surroundings. These brooders can be built of ordinary lumber, and are very simple and inexpensive. Make a separate board floor for this brooder and place a lot of chaff or litter over the floor, as this makes it more comfortable for the chicks.

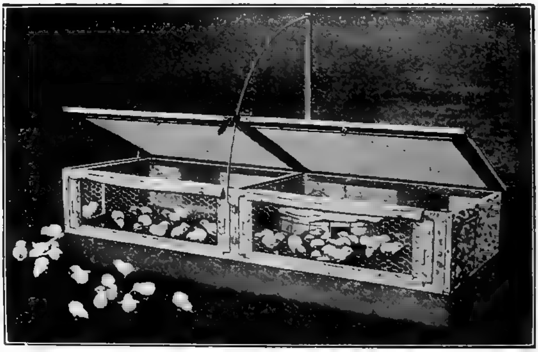


FIG. 3

Fig. 3 represents a Neimann Model Fireless Outdoor Brooder. Size 3 by 7 feet, with double walls of galvanized iron with a dead-air space between.

The roof or cover can be set from any angle up to perpendicular, being locked to the curved iron rod with a quick-acting latch, holding the roof securely. Directly under the roof and hinged thereto at the rear are two cloth frames, held in place at the front with a button which, when the roof is raised and the weather cold and windy, may be let down, thus keeping out the cold, yet letting in light and sunshine. There are also two wire-covered frames over the top of the brooder, recessed so as to let the lid down tight over the brooder, which may be slid to either side, giving access to the inside of the brooder.

The right half of the brooder is fitted out with a removable galvanized floor, and the fireless hover, Fig. 4, is placed in this compartment. A hover that admits fresh air all around its sides without draft, and one that can be enlarged from 12 to 22 inches in diameter, a feature that is very essential in brooding chicks without artificial heat, as chicks, when young, should almost fill out the nest; for if they only fill out part of the nest they will not keep warm in cold weather. Flannel sewed like a sack and stripped over a galvanized iron skeleton frame forms the side walls, and this flannel wall can be easily removed, washed, and replaced, making it sanitary. No floor is used in the hover; it is simply set on the floor of the brooder, several inches of straw or hay put in and flattened out so the nest is level, the top cover put on, and it is ready for the chicks.

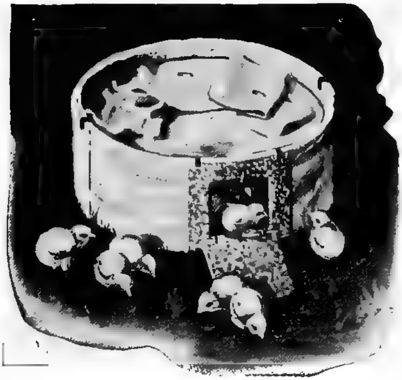


FIG. 4

A small door in its side admits the chicks, which may be closed at night so as to keep them from getting out too early in the morning when straw is taken out and a handful of fresh straw put in again.

The other half of the brooder is filled with several inches of ground to raise it above the outside level, and litter is put in for chicks to scratch in for their grain.

Narrow strips of wood are furnished for the hover end of the brooder, and a double cloth-covered frame for the top is furnished to be used for winter and early spring, which gives the hover compartment extra walling, which the chicks can easily heat up.

When the chicks have grown up large enough so that they do not need a hover any more, the brooder may be used as a colony coop; everything may be removed inside the brooder, removable roosting-sticks may be put in them, and they can roost in there till they are quite large.

Ordinarily we do not recommend galvanized iron roof, galvanized houses, galvanized hovers or brooders. The heat from the fowls' bodies

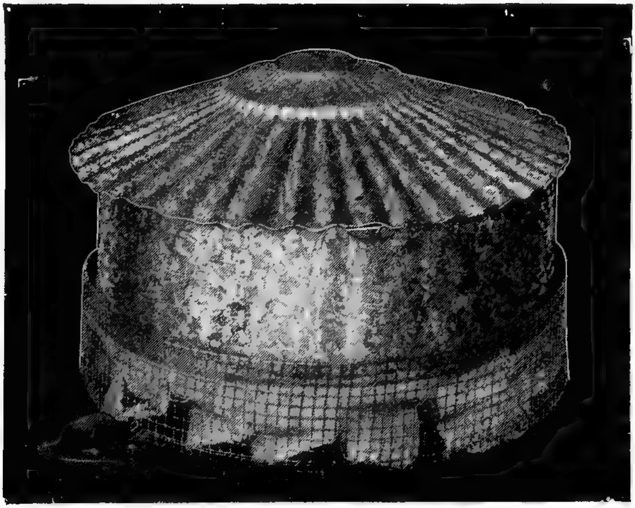


FIG. 5

causes the iron to sweat, and they are therefore sometimes damp, and are cold in winter and hot in summer. But in this case you have a cloth hover, and the brooder box proper has a double wall with a dead-air space, which commands this fireless brooder over some other styles of galvanized iron brooders.

Fig. 5 shows a Simplex Fireless Feather Brooder. This shows the complete brooder with the curtain and rat guard lowered.

The round body of the brooder is made of heavy galvanized iron with a removable top which extends one inch over the edge of the body, thereby preventing any water from entering ventilation holes. A cloth curtain to prevent cold and draft is constructed so that it can be raised or lowered at will. This curtain is rigidly attached to a hoop of galvanized iron and will not wear out. On the outside of the curtain is a ring of galvanized wire netting, which is to be lowered at night to keep in the chicks and keep out the rats and other rodents. It is also advisable to lower this netting for the first twenty-four hours after putting the chicks into the brooder.

This is a very important device in connection with this fireless brooder, for one of the difficult things is to get the chicks to stay in the fireless brooder the first few days. If you can teach them where to go when they get cold, you can often do quite well with fireless brooders.

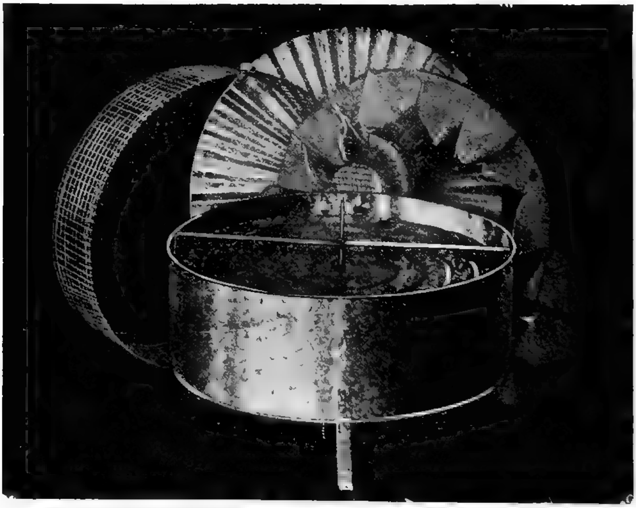


FIG. 6

Fig. 6 represents the Simplex Fireless Feather Brooder with its various parts separated. Here you can see the rat guard, the cover, the curtain, and on the inside you can see the disk to which feathers are attached on the underneath side. You can also see the rod in the center by which the disk of feathers can be raised or lowered.

This disk can be raised or lowered to suit the size of the chicks by simply turning a wing-nut. The natural feathers are attached to this disk in such a way that the little chicks can pass under and through them and push their backs up against them and act just the same as they do when hovering under the hen. There is no way for the chicks to get on top of the feathers and soil them, or to crowd each other and smother to death.

**Fig. 7** is a view of the bottom of the Simplex Fireless Feather Brooder, showing the thickness of the feathers. In speaking of their brooders, this idea is advanced: "Chicks get under the hen to retain their own natural

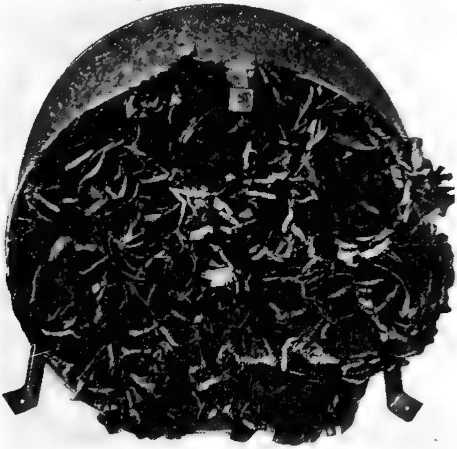


FIG. 7

body heat; the same as you put on underwear and an overcoat in winter. Your natural temperature is about 98½ degrees; yet you enter a room in which the temperature is only from 65 to 70 degrees to get warm. Your temperature does not raise when you enter the room, but you feel comfortable."

Fig. 8 represents a little indoor fireless brooder, made by the Petaluma Incubator Co. You can see the little ventilating pipes in the roof of this

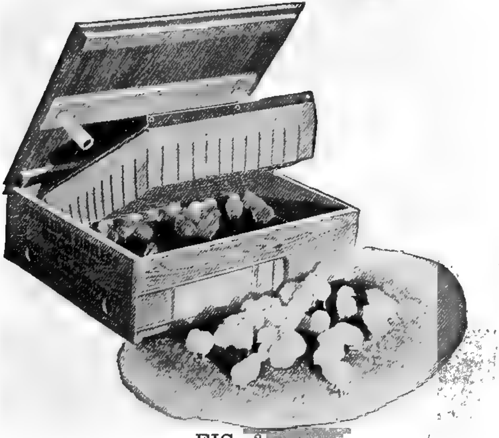


FIG. 8

brooder, which take away much of the bad air and does away with some of the objectionable features of a fireless brooder. The hover itself is made of wood, and the cloth above retains the heat of the chicks' bodies. This cloth should be renewed at least once each season.

## PORTABLE OR MOVABLE HOVERS

One of the best things which has been invented in recent years for the brooding of chicks in small lots has been the portable or movable hovers. These hovers can be used in any kind of a building or box or brooder. They can be picked up and moved from place to place for the purpose of cleaning or for any other reason that may be necessary. This can be done at any time without disturbing the lamp or turning down the flame. When they are first hatched, from 50 to 100 chicks can be put under one of these hovers.

For those who are in the business on a small scale, not a much better system of brooding can be found than by using some good make of portable movable hovers in colony houses or other poultry houses as you see them used in Fig. 14. Some of the larger farms even use this method. If you desire to raise a good many thousand chicks each season, we believe there are some more labor-saving methods, because you can raise them in larger flocks. These hovers are light and can be moved about to a new spot. If you desire to use a number of them in a long poultry house, each hover can be separated by a two-foot one-inch mesh poultry netting. As the chickens grow older and become large enough to do without artificial heat, then the wire can be taken down and the hover stored away for another season.

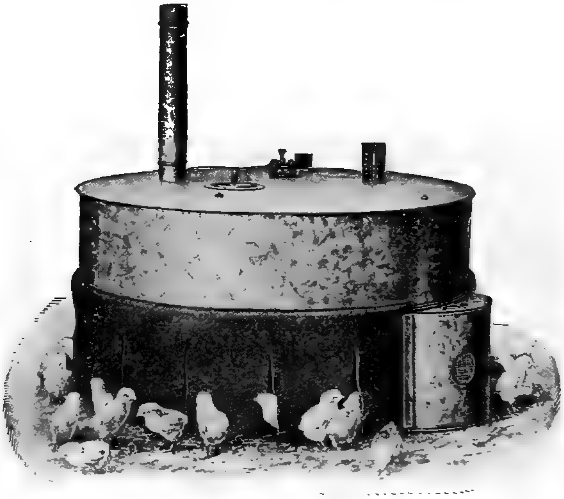


FIG. 9

Fig. 9 represents a Portable Hover. This can be used in any room, poultry house, brooder house, colony house, or a large closed box which is light and well ventilated. The chicks are on a level of the surrounding floor, and have no incline or step to go up and down as they have in many brooders. One desirable feature of this hover is the fact that it is self-regulating, as well as self-ventilating.

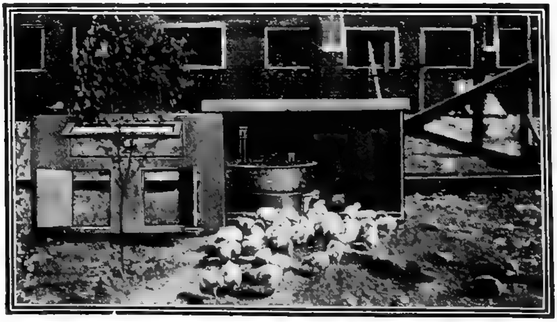


Fig. 10

Fig. 10 shows Cyphers Portable Hover which is being used in a large dry-goods box. If you wish to brood your chicks in lots of 50 to 75, there is not any method that is much superior to hovers built after this style so they can be moved about, as this one shows. After the brooding season is over, such hovers can be stored away in a conveninet place until the following season. In this way the hover can be protected from damage, and the building in which they are located during the brooding season can be utilized by the growing stock and the laying hens and pullets the remainder of the year.

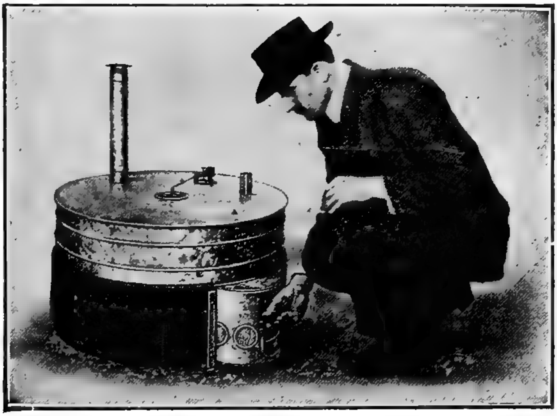


FIG. 11

Fig. 11 is a photograph of the Cyphers Portable Hover, showing operator in act of closing circular, sliding door to oil-tight and flame-tight lamp box. Circular door opens and closes by revolving inside the outer wall of box. Air intakes in sliding door that supply oxygen to lamp flame are covered with fine-mesh, brass wire gauze, through which flame and sparks cannot pass. Note sight-hole in top of lamp box for viewing height and condition of flame.

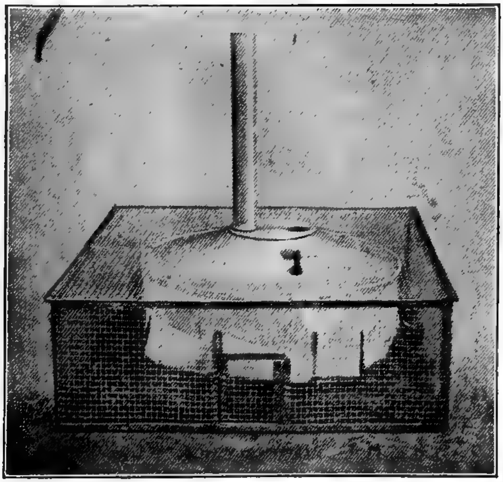


FIG. 15

Fig. 12 illustrates the plan on which a Sanitary Hover is built and operated. The lamp is in the center, and the curtain around the outer edge and the radiating drum above retain the heat.

This is one of the best styles of movable hovers, as it can be easily lifted and moved from place to place. You can brood from 50 to 100 chicks in one of these hovers.

Fig. 13. Instead of the lamp being on the side, as on most hovers, it is placed in the center of the Sanitary Hover. You can see the attendant moving lamp from the hover. This enables you to fill the lamp without getting down on your knees to do so. Each kind of brooder has its advantage and its disadvantage.

Fig. 14. The Portable Sanitary Hovers are here being used in a laying house. You can do the same with all other styles of movable or portable hovers. You can use the movable hover in a laying or breeding house, and then, after the chicks are old enough to do without heat, the hover can be stored away, and the building used the remainder of the year for laying and breeding purposes.

Fig. 15. Here we have a Portable Sanitary Hover used in a rat-proof cage. A cage like this should be used about any hover for the first few days, at least. It keeps the chicks close to the hover until they learn where to get warm.

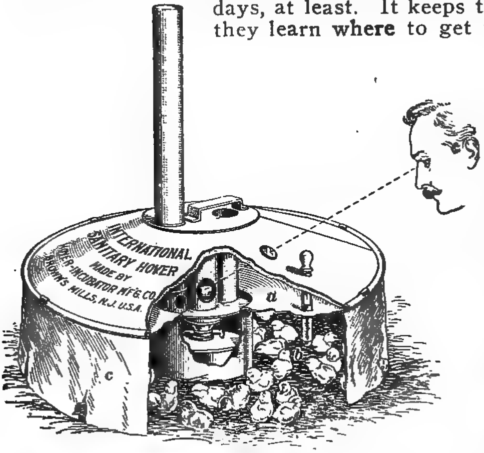


FIG. 12

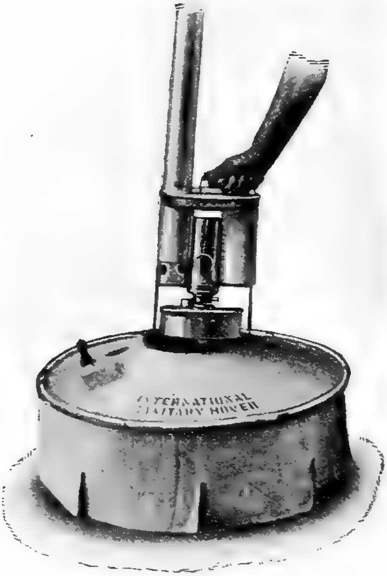


FIG. 13

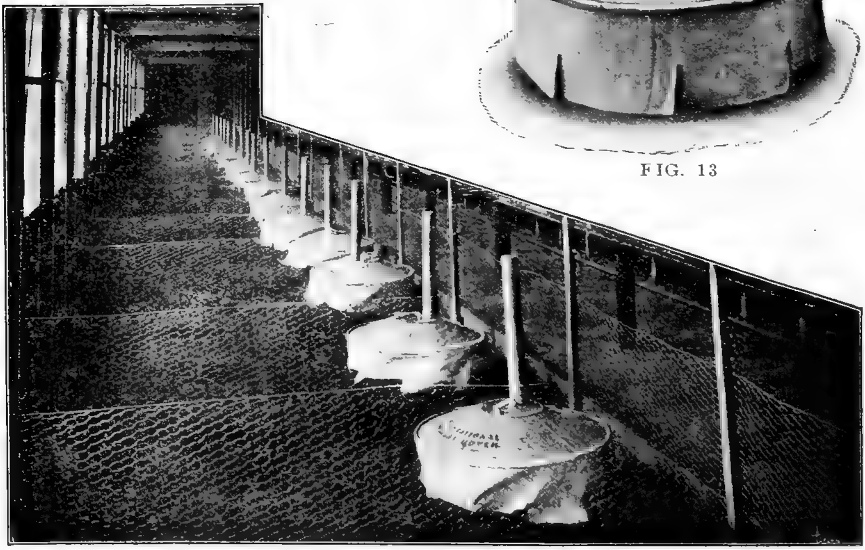


FIG. 14

The cage also protects the chicks from the rats and cats. A little common sense, applied in taking a few precautions like this, will often add much to your success.

Fig. 16. This figure will indicate to you the ease with which a Prairie State Brooder can be moved from one place to another, for cleaning out under the hover or examining the chicks without disturbing the lamp in any way.

The Prairie State Hovers are open all around, are very high, and there is forced into them a constant current of warm, fresh air which circulates into all parts of the brooder constantly. It applies the heat over the backs of the chicks by radiation. A brooder of this type gives good satisfaction during the coldest weather of winter. They have a wide range of adaptability.

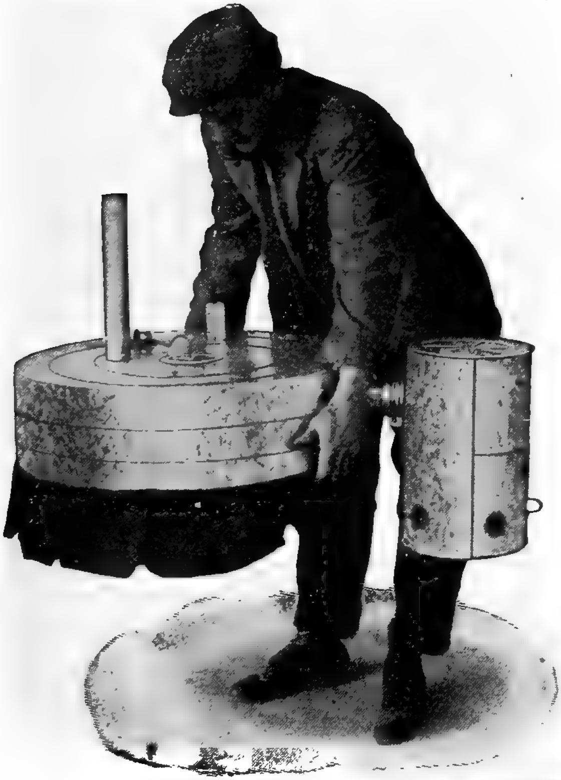


FIG. 16

Fig. 17. This shows the door raised, lamp removed, and a conical depression in bottom of the lamp case, which automatically enters the lamp. It is self-regulating. The thermostat can be seen on top. It is not necessary to remove the lamp to see the flame. The company states that it will burn three-fourths to a pint of oil every twenty-four hours at an average operating temperature of 60 degrees.

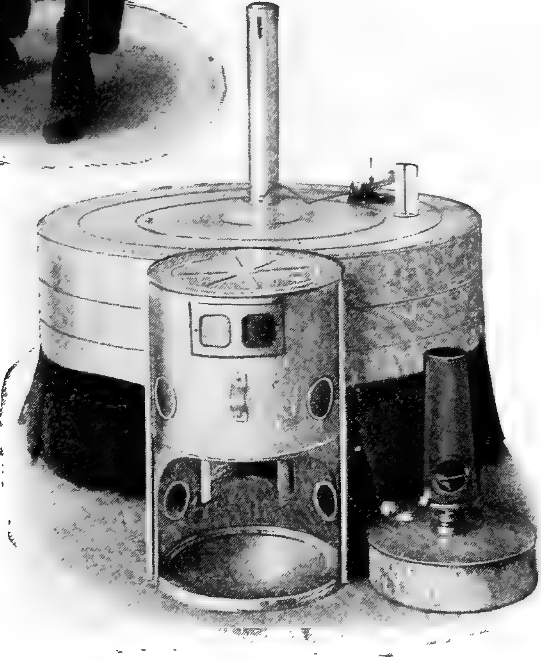


FIG. 17

Fig. 18 illustrates a chick guard made of hardware cloth, used for confining the chicks for the first few days near the heat until they learn to go back and forth as they need to do. There is always danger of the chicks huddling in some corner, more especially near the sunlight, and getting chilled. No matter what brooding system is used, it is a good idea to use a wire guard of some sort to confine the chicks close to the hover for the first few days.

Fig. 19. It is necessary to conduct the oil fumes out of the house unless you are using the open front type, which is not suitable for cold weather.

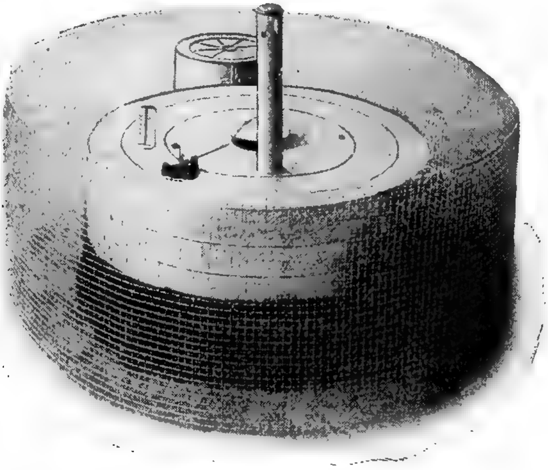


FIG. 18

This figure will show you the method of the Prairie State in getting rid of the escaping fumes from their portable hovers. You can do the same with

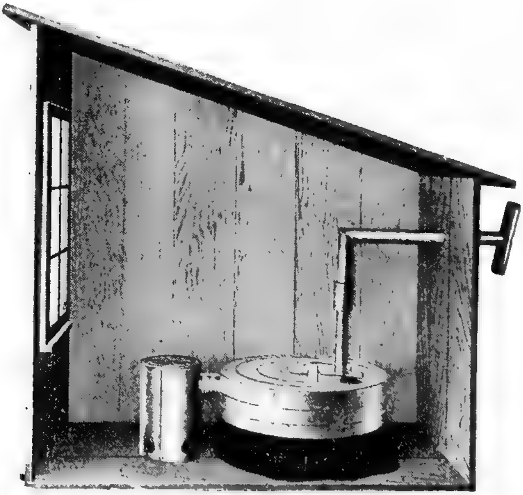


FIG. 19

any of the other systems. These brooders are all of metal, and, if properly cared for, will last for a long time.

Figs. 20 and 21 show the Oaks Brooder Hover with a cage surrounding it which keeps the chicks near the hover for the first day or two. This cage also makes the hover rat-proof. The construction of the lamp box is also shown. With all lamp hovers it is not advisable to turn the flame very high to begin with. As the hover and burner get hot, the flame will increase in size and will smoke if turned too high to begin with after being trimmed, lamp filled, and relighted.

Fig. 22 shows an ordinary dry-goods box that has been converted into a good out-door brooder by placing one of the Oaks Economy Hovers inside of same. In case this particular style of hover is used, they recommend not allowing the draft pipe to extend outside of the box. Use plenty of litter around the hover.

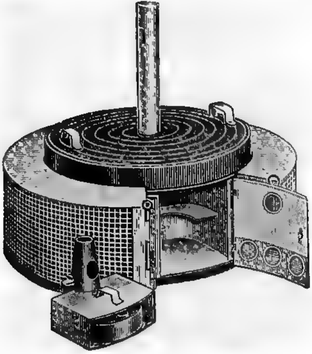


FIG. 20

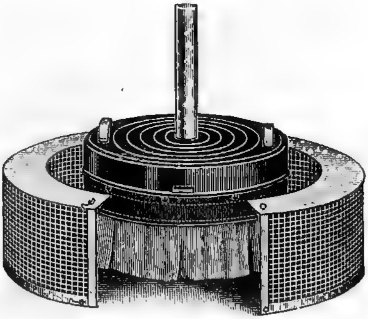


FIG. 21

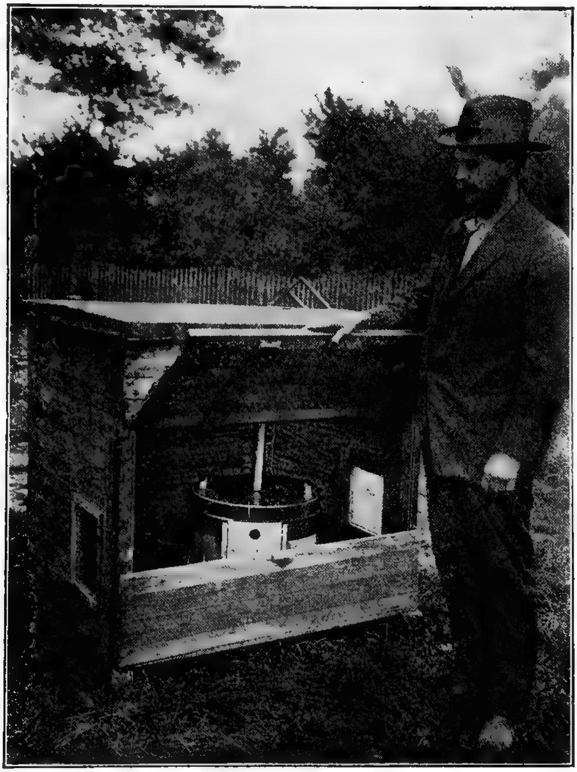


FIG. 22

Fig. 23 represents a Victor brooder. These are made in different sizes so that from 50 to 75 chicks may be accommodated.

Study the illustration. Note the form of the radiator. Notice that the hottest pipe follows the outer edge of the brooder. No center heat. Note the location of the lamp. The brooder is circular; no corners for chicks to crowd into. It is sanitary. Easy to clean; just tip it on its side. It is portable; can place it anywhere. No special house required.

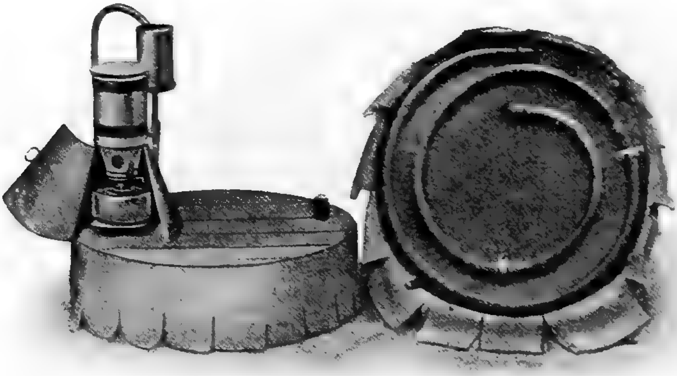


FIG. 23

Fig. 24 shows a Buckeye Portable Hover being operated in a small coop. Such hovers are portable and can be satisfactorily operated anywhere, in a brooder house, in a colony house, on a barn floor, in a piano box, or any other place where the drinking water does not freeze. No flues to connect—no platforms to erect. Each hover accommodates from 50 to 100 chicks.

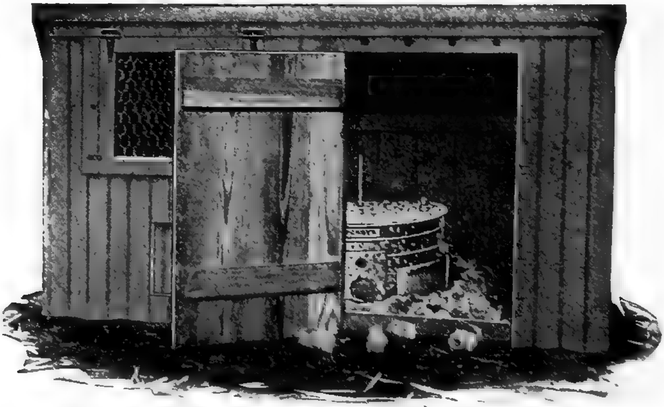


FIG. 24

Fig. 25. Showing a convenient yard of one-inch poultry netting 12 inches wide around a Buckeye Portable Brooder. A yard like this should always be used until the chicks are a weak old. It keeps them from straying too far from the place to get warm.

This brooder has a dead air space below the top, and the lamp is on side and the exhaust tubes on the opposite side so the heat is drawn over the chicks from one side to the other.

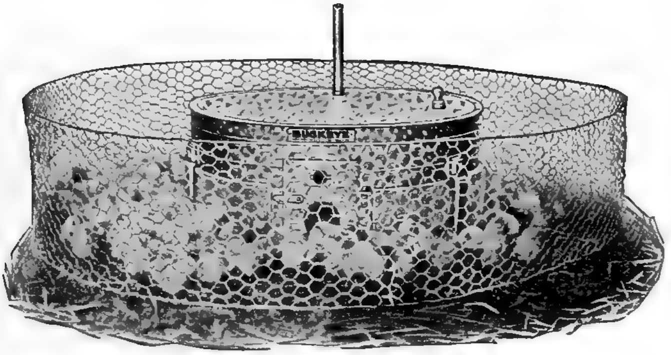


FIG. 25

## ADJUSTABLE OR ADAPTABLE HOVERS AND BROODERS

If a person is raising chickens on a city lot and only expects to raise a few, or has some building already built to which he would like to attach a hover of some sort for brooding chickens, some of the adjustable or adaptable hovers may be used for that purpose. The out-door brooders shown here give very good satisfaction, and answer every purpose if you only want a few chickens and do not care to go to the trouble of fixing a colony house or coop for the purpose. The portable and movable hovers are largely taking the place of the hovers which require that they be attached to the house. The portable ones are proving just as satisfactory and will raise just as many chicks, and you are not troubled with having to attach and detach them each season. To anyone who expects to raise many chickens, we recommend the portable or movable hovers in preference to those which have to be attached to the house.

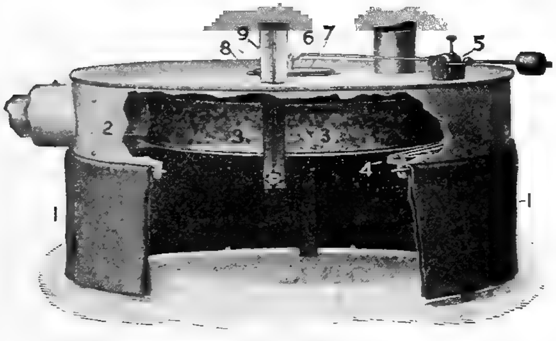


FIG. 26

Fig. 26 shows the method of construction of a Cyphers Adaptable Metal Hover with curtain (1) and part of hover for free use of the chicks; also position of the heat drum or radiator (3, 3) and zinc and steel thermostat (4) that operates regulator (5). The hover is made of galvanized iron, with a five-inch rim extending downward on all sides and confining the heat to this level. The under side of hover and inner surface of rim are lined with asbestos to prevent excessive radiation. Hover has an opening (6) through its center, which is converted by the regulator disk (7); also a small opening (8) to receive the upright thermometer (9). Hover is supported on three metal legs, and space underneath hover is enclosed by a double-fold curtain that is slit at convenient points to allow chicks to pass in and out.

These hovers can be attached to any sort of a colony house, large box or brooder.

Fig. 27. This shows one of the Cyphers Adaptable Hovers attached to a home-made brooder. If you so construct your box or brooder that you can get the right amount of ventilation, the next most important thing is the heater and hover. Any sort of an old box or a brooder made of rough, cheap lumber will often answer if you have a good heating device and hover like this attached thereto. The chicks must be protected from the rain, storm and drafts, of course.

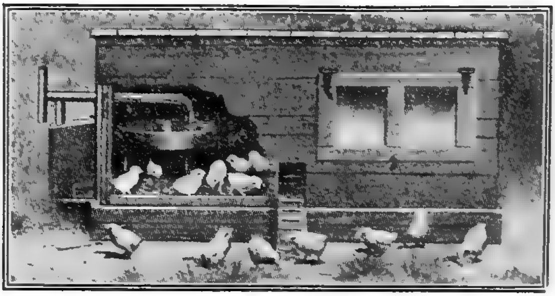


FIG. 27

Fig. 28. The Wigwam Outdoor Brooder supplies fresh air from the outside. The air or water is heated and passed in among the chicks and forces its way through the hover curtains, which prevents the cold drafts from striking the chicks. The source of heat is supplied by a circular tank attached to the hover above the heads of the chicks.

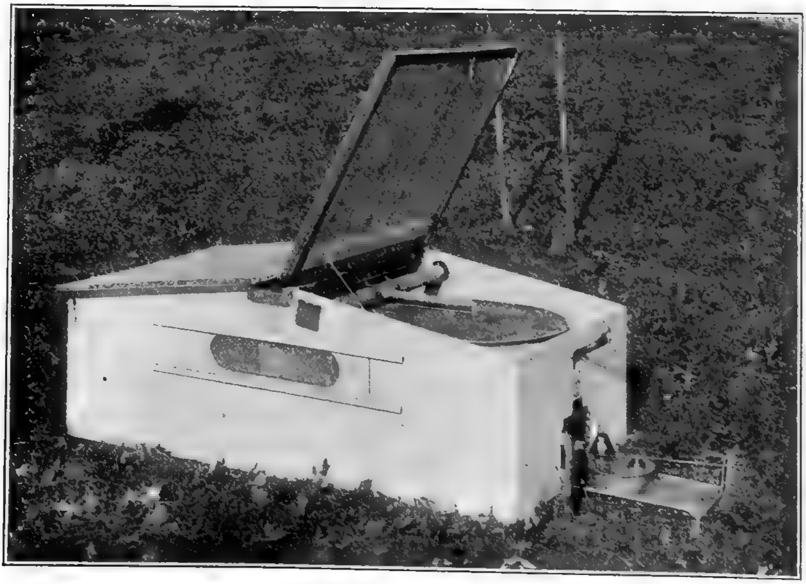


FIG. 28

Fig. 29. Here is shown both roofs raised on the Wigwam Brooder. The hover is hinged to lift up or out for cleaning. This makes it easy to clean. The tank operates with either hot water or air. The fumes pass out the cross pipe seen in the figure and do not enter the hover where the chicks are.

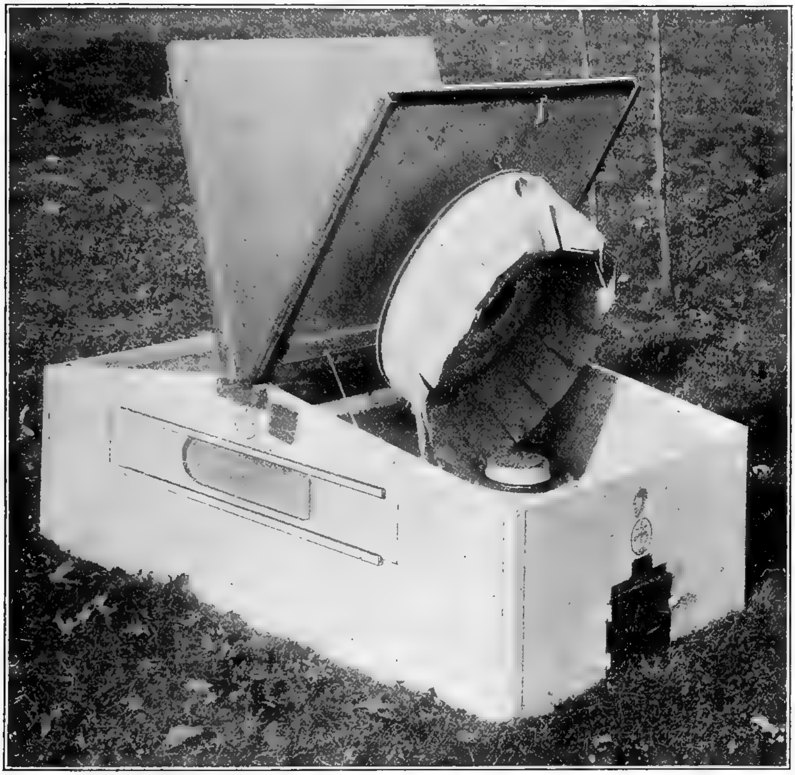


FIG. 29

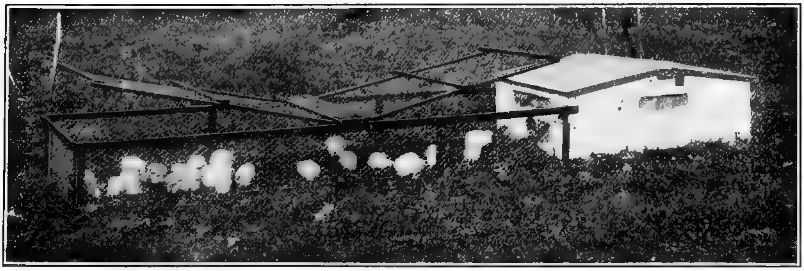


FIG. 30

Fig. 30. This illustration shows the brooder in operation with a run in front, which is used until the chicks are large enough to be allowed away from the brooder for range. It is an added protection from hawks and cats, and also prevents the chicks from scratching in the garden and flower-beds, and from disturbing your neighbors. It is a great mistake for any poultryman to allow his chickens to prove a nuisance to the community in which he lives.

**Fig. 31.** This illustrates the Duplex Brooder of the Petaluma Incubator Company. It has the same principle as their Mammoth Brooding Outfits. Coal oil lamps are used on their brooders that are five feet long; for their longer brooders they recommend the use of the gasoline burners. The brooders shown in this illustration have gas burners attached.

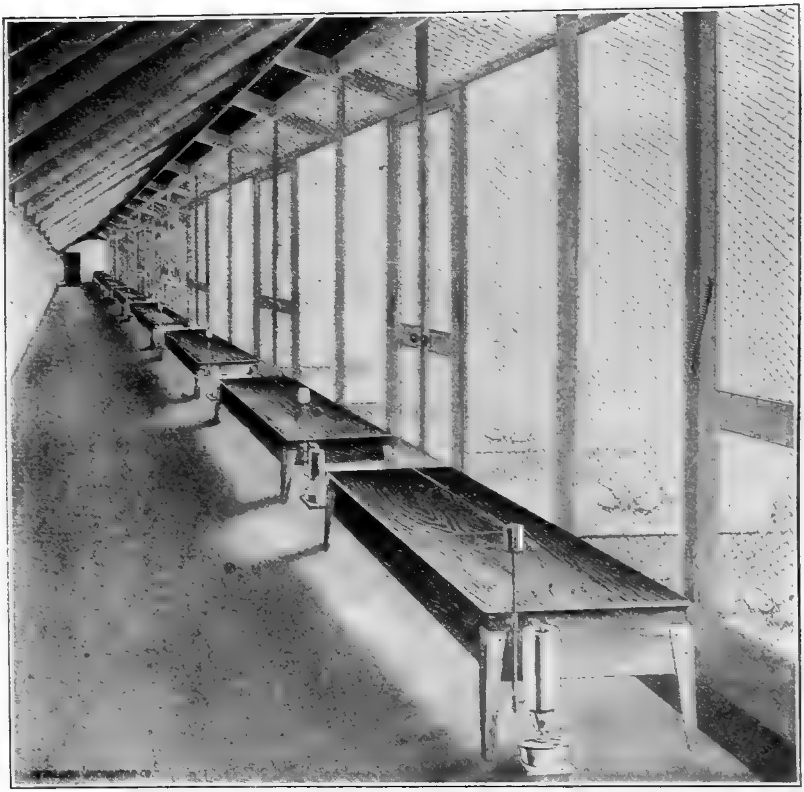


FIG. 31

## HOVERS HEATED BY ELECTRICITY

32. Electrically heated hovers are very satisfactory and can be economically operated if the electric current is not too expensive. This varies in different localities, so you will have to be your own judge as to the wisdom of adopting this plan. Fig. 32 illustrates a Cyphers Portable Adaptable Electro Hover. This can be used in almost any sort of a box or ordinary outdoor or indoor brooder.

Fig. 33 shows a Cyphers Electro Hover in a brooder that is complete and ready for use. It can be used at almost any place that any other hover can be used. If you expect to depend upon electricity with which to brood your chicks, you should know positively that you can get the current twenty-four hours each day, including Sundays. If you can arrange to brood your chicks with a device like this, you will find it a saving of labor; freedom from fumes and gases, and economical from a labor standpoint.

On account of the saving of labor, you can afford to pay a fair price for the electrical current. These hovers are fire-proof, and they can be used in any location.

Fig. 34 shows a Lo-Glo Electric Hover. Electric brooders will conveniently, safely and successfully raise chicks. The chicks always have plenty of fresh and pure air, because there are no kerosene or coal fumes to contaminate the atmosphere. There is no high resistance to kill the nourishment in the air, nor does it dry the oil from out of the skin of the chick and the feathers come out very silky and glossy.

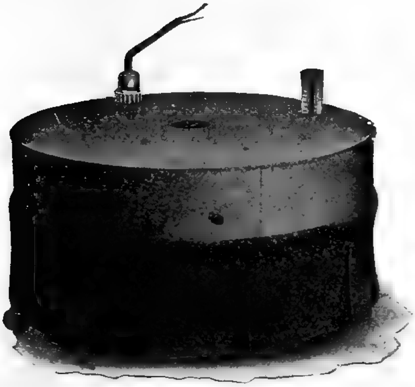


FIG. 32

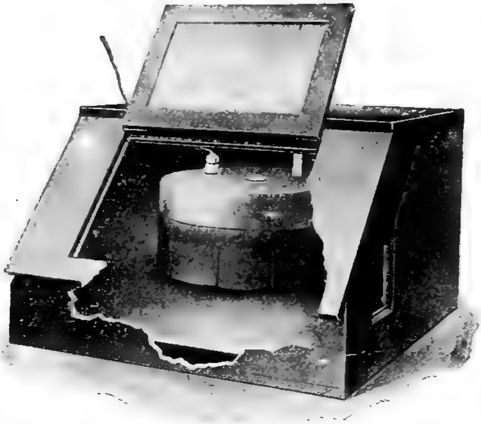


FIG. 33

In most cases chicks are carried off by improper brooding, caused by ***over heating*** and over crowding. In electric hovers the temperature never changes. The chicks have light to move about. If they are hungry, thirsty or sick they can see to do as they please.

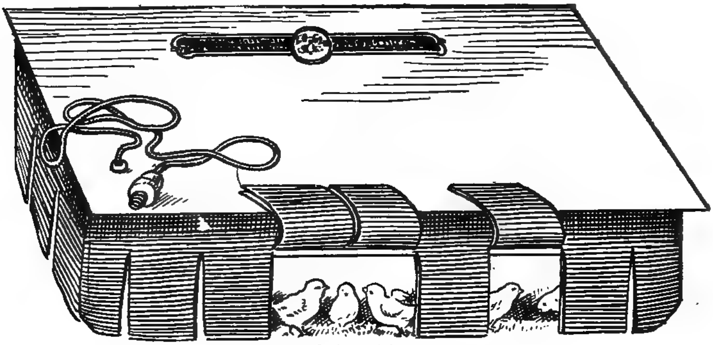


**FIG. 34**

Wherever electric current can be secured at a reasonable price, we like it very much for hatching or brooding, or for lengthening the day in laying houses. It is clean and easily operated and controlled when once installed. One of the best electric brooders is that sold by the Petaluma Incubator Company, Petaluma, California. It is not a very difficult thing to make a home device for brooding by electricity.

## CORNELL GASOLINE HEATED BROODERS

Prof. James Rice of Cornell University has the following to say of brooding chicks in large flocks: "It was found that one flock of 100 chickens running together did as well or better than two flocks of 50 chicks each. A very large hatch later in the season, when press of work prevented the building of more colony houses, compelled the putting of 200 chicks under one enlarged hover. These chicks apparently did as well as those kept in flocks of 100. As a result of this experiment all of the colony houses were fitted with large hovers for 200 chickens, and the outdoor brooders were entirely abandoned. The system has been thoroughly tried by us for the past seven (now ten) years. . . . The most expensive factor in rearing chickens is the labor required to handle the large number of brooders necessary where the chickens are kept in small flocks."

To enable them to do this, the Gasoline Heated Brooder was invented at Cornell, which is fitted to a colony house. They carry about 200 chicks in each one of these houses. Care must be exercised that you get clean gasoline. The house has to be kept level, so the gasoline will remain in the burner box. If the house is uneven, it will extinguish the flow.

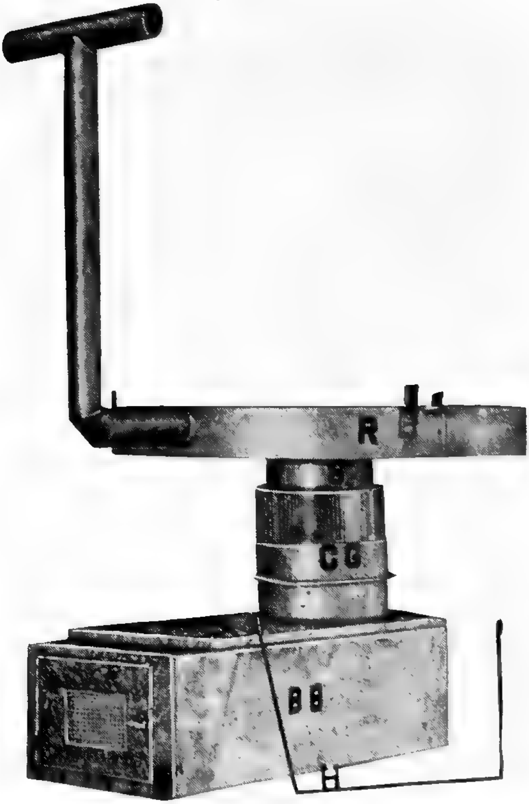


FIG. 35

Fig. 35 shows the galvanized box which holds the gasoline burner and protects it from any draft, and above that you can see the heat drum. A wooden hover is built to go over this. Cloth is tacked around the edge to retain the heat, and the hover is hinged to the rear wall so it can be raised and lowered. Legs support the hover in front. The hover should be about two inches above the heat drum. The pipe runs through the wall to the exterior of the building so that the fumes will be taken from the building. Some succeed with this method. Others do not like it. We think some other methods are safer and just as satisfactory. The houses in which these heaters are used are illustrated by Figure 87.

## THE BROODER STOVE

During the past three or more years the colony or coal burning brooder stoves have been developed and improved until at present they offer perhaps the most satisfactory type of brooding equipment. There is no cost for equipment, and considering the large capacity and relatively low cost, this is a much cheaper form of brooding than any previously practiced. If the capacity of these stoves and the rooms in which they are used are not overtaxed with too large a number of chicks we feel sure they will give entire satisfaction. We would advise using no less than 200 chicks with one of these stoves and no more than 500 in most cases.

## COAL HEATED BROODER STOVES

One of the best systems of brooding chicks that we have at the present time, in lots of from 250 to 1,000 chicks in one room or in a double room, is by the coal-heated brooder stoves. You can brood about twice the chicks with half the labor and cost that you could by the old methods. Also the mortality is much less, if properly handled, than by many of the old methods. These stoves can be used in houses 12 feet square or larger, or in houses that are 10 feet deep and 18 to 20 feet long, with a partition in the center and a door for the chicks to pass into the cooler room when they wish to get away from the heat. Or these stoves can be used in the "Foolproof" laying or breeding houses, and after the brooding season is over the stoves can be taken out and the chicks reared in these houses. If you will select one of these systems that is giving satisfaction, we can heartily recommend this method. The stoves are not expensive, and the system is worth trying out if you expect to raise poultry on a large scale for the purpose of making money from the business. It is necessary for the house to be properly ventilated, of course, no matter what system you use. We recommend brooding chicks by coal heated brooder stoves. Where oil is more easily secured, that is also satisfactory.

## ELIMINATES WORK, WORRY AND EXPENSE

With the advent of the colony brooder stoves, was solved a perplexing problem for the poultryman. Heretofore the question of brooding meant untiring vigilance and worry on the part of the poultryman who wished to avoid a high rate of mortality among his chicks.

Where one has installed a good reliable colony brooder stove, such as we recommend in this lesson, there is little need of this constant worry and extra expense, and with just a little attention from the attendant he can rely on his having at least comparatively good success. Contrary to the old methods, there is but little danger of fires, thus eliminating another big factor in the brooding business.

## ESSENTIAL CONDITIONS

There are several essentials that the poultryman must always bear in mind if he hopes to have success with his baby chicks during the brooding period. First, and perhaps the most important of all, is the question of heat. He must be very cautious to see that the heat is uniform at all times. Second, he must see that there is an abundance of fresh air without drafts, and third, the chicks must have plenty of exercise, and they should be watched so that they do not form the habit of crowding, but where the heat is even there is very little danger of their doing this with the modern brooder stove.

The poultryman must not overtax the size of his brooder. Good judgment must rule here and the size and age of the chicks must be taken into consideration.

## THE ONE AND TWO ROOM METHODS

Elsewhere in our brooding lessons we mention that one of the secrets of success in brooding is to have a cool room in which the chicks can exercise and get away from the heat if they are so disposed. There is no better way to provide for this than to have the two-room brooder, one room in which you have the brooder stove and another room that is several degrees cooler, and yet not cool enough to cause the chicks to chill. This method has been used to great advantage among poultrymen who have successfully brooded and raised as many as 250 to 1,500 chicks in one house. You can brood chicks in larger flocks in mild climates like California than in the average climate.

It stands to reason that the two-room method would be the more successful of the two because in this way they have a larger space in which to exercise and have a range of temperature that would be conducive to their future growth and vitality.

## SIZE OF THE HEATER IMPORTANT

The size of the heater is important in that it determines whether or not the brooder is appropriate for the particular building in which it is to be used and just how many chicks can be raised.

Before buying your heater, take into consideration the size of your room, then buy accordingly. Do not undertake to place a large heater in a small room, or vice versa. A large heater in a small room means too much heat and consequently the chicks will crowd into the corners to avoid the extreme heat. A small heater in a large room means the chicks will be forced to crowd around the hover when they seek proper temperature. In either case there is sure to follow disastrous results.

Fig. 36 gives you an idea of how the Newtown Giant Brooder takes care of the chicks. There is a great advantage in being able to rear the young stock in large units, so as to cut down the labor expense as low as possible. Many poultrymen throughout the country are meeting with fine success with the coal heated brooders, which are less expensive to operate than those heated by gasoline or kerosene.

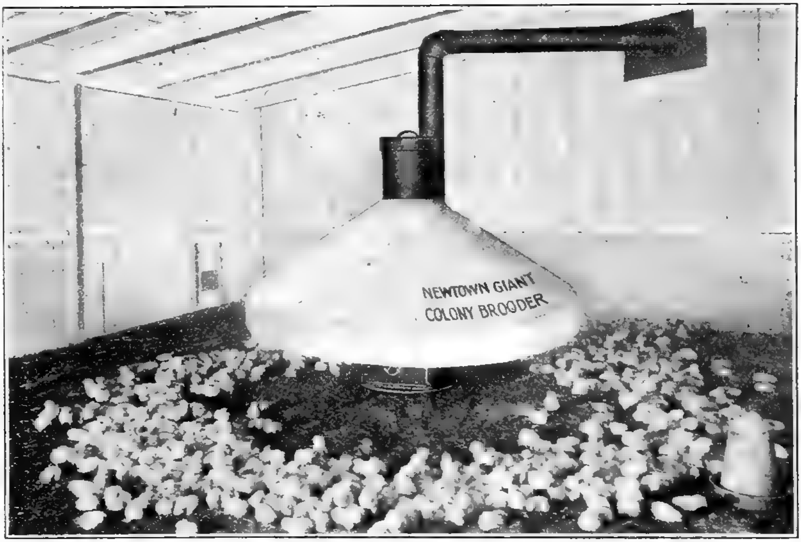


FIG. 36

They are so constructed that they can be moved from house to house, and by using houses large enough to carry the pullets during the winter the stoves can be removed when the chicks no longer need heat, and the chicks be allowed to grow to maturity in them and in the fall are used for winter laying houses. This eliminates the idle colony house and saves in the investment in buildings.

This is especially a good plan where the poultryman is catering to the broiler market. By hatching very early in the season, it is possible to sell out the first hatch and then rear the breeding stocks, which would insure a maximum use of the house.

It is possible by using wire partitions, to rear chicks of different ages around one of these stoves. As a rule, this is not a good plan, and it is an especially bad one when chicks of different ages are placed together. If you brood chicks of more than one age around the same stove, use wire partitions. Allow the wire partitions to lead from walls to stove; divide the room into halves or quarters.

The No. 2 Newtown Heater has a magazine that holds 65 pounds of coal, and the No. 1, 45 pounds. The fire is fed automatically. As one piece of coal is consumed, another drops in to take its place. In this way sudden drops of temperature do not occur from dumping on a large fresh supply of coal.

Fig. 37 gives a cross-section, which shows heat circulation and construction, also the container for the coal. It has a thermostat for the regulation of the heat and a heat-deflector which throws the heat, radiated by the drum, downward upon the backs of the chicks.

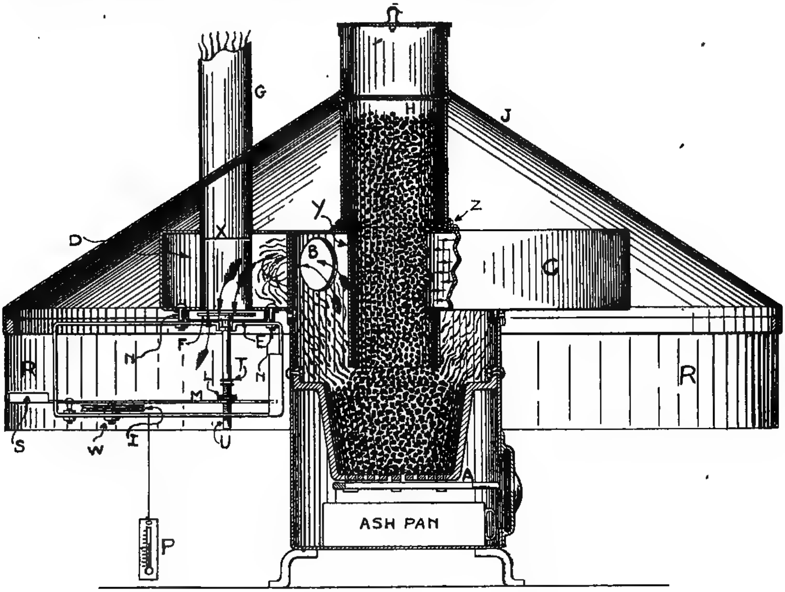


FIG. 37

The automatic regulator of the Newtown Colony Brooder consists of a single damper, operated by a thermostat, which controls the throttle and check drafts.

The heat-radiator has a special heating drum, into which all the heated gases from the fire pass.

The deflector is large and has a removable metal rim, which extends down to within ten inches of the floor. This is used only in extremely cold weather.

Fig. 38 shows the operator putting coal into the stove. These stoves have to be filled about once in every 24 hours.

Fig. 39. The Newtown Colony Brooder with deflector tilted for cleaning. The special feature eliminates the necessity of ropes and pulleys for raising the hover. This model is fitted with the same types of grate, magazine, fire bowl and ashpit door as the larger sizes. It is also equipped with the Newtown Regulator which controls both the main and check draft openings. The heater is larger than any other brooder of this type.

Fig. 40 shows a Standard Colony Brooder in operation with 1,050 chicks. There are no gases or fumes arising from the stove. The smoke pipe leading from the fire pot is always wide open, and consequently the smoke and gas arising from the coal is immediately carried away. There are no dampers or valves of any kind between the smoke pipe and the fire, as the draft is controlled by a device that makes them unnecessary.

The chicks are supplied with a continuous supply of pure, fresh air by the automatic action of the draft on the stove. All the air passing through the stove is drawn in at the bottom, so that the atmosphere under the hover undergoes a complete change every fifteen minutes.

As a further guarantee for the purity of the atmosphere, there is an opening at the top of the hover which is never closed, so that any of the foul air arising from the chicks is carried off immediately.

The purity of the atmosphere provided for the growing chicks is a most important factor to their health and growth.

Fig. 41 shows the convenient arrangement for coaling a Buckeye Standard Stove. Nothing is disturbed but the lid of the magazine. Stoves of this kind have actually revolutionized the whole poultry industry by helping the breeders to raise a much larger percentage of their young stock with just about one-fourth of the labor.

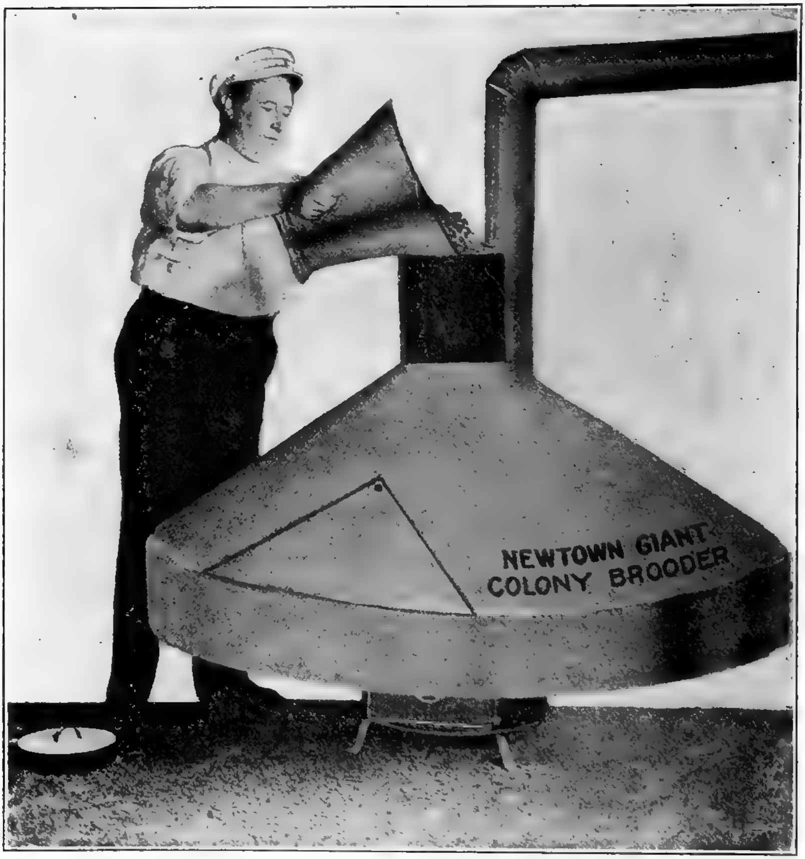


FIG. 38

For the big breeder it has been a veritable God-send, and in a large number of cases has turned losing propositions into highly profitable plants; while for the smaller breeder it has been just as valuable.

Of course we consider hard coal a little more desirable than any other fuel—simply because it is cleaner—but aside from a more frequent cleaning of the flue, we have found soft coal, coke, charcoal and briquettes to be just as satisfactory as the anthracite coal. We recommend chestnut sizes in all kinds of fuel for all kinds of coal burning brooder stoves. We prefer hard coal, if obtainable, or semi-anthracite, or a mixture of the two.

Fig. 42 shows the convenient arrangement for reaching the stove to shake down the ashes and empty the ash receiver of a Buckeye Standard stove. With stoves like these a man can take care of about 1,000 chicks with the same time and labor that he formerly took care of 100. It is a well established fact that every chick is not entirely comfortable in the same temperature—some require a little more heat, while others require less. Under the conditions provided by the Colony Brooder, every chick can seek the

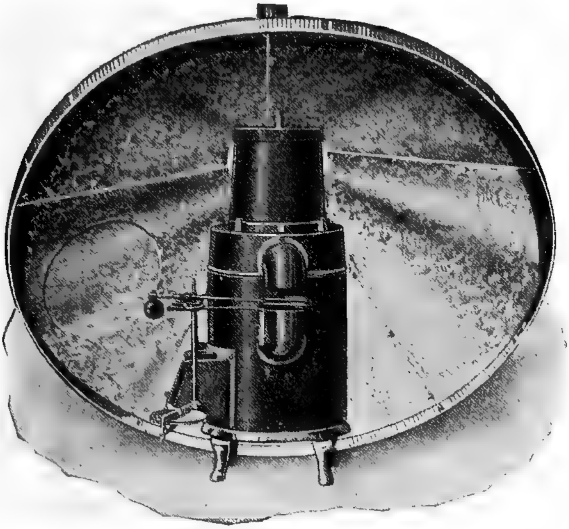


FIG. 39

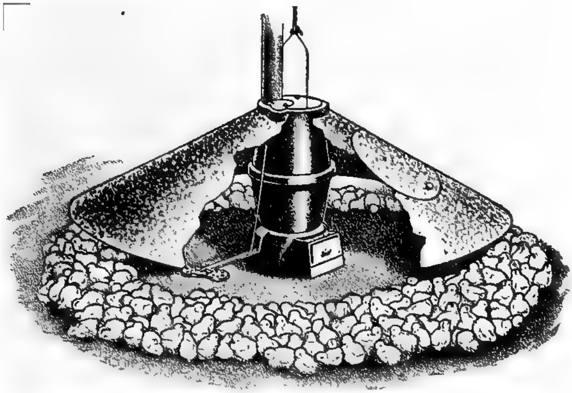


FIG. 40

precise temperature that suits it best. If it needs plenty of warmth it moves closer to the stove, and if it requires less heat it moves farther away from the stove.

Fig. 43 is a Wotherspoon Eureka Stove in operation. This stove is one of the kind which has the regulating damper on top of the stove, and operated by thermostats.

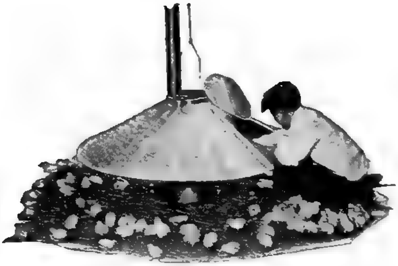


FIG. 41

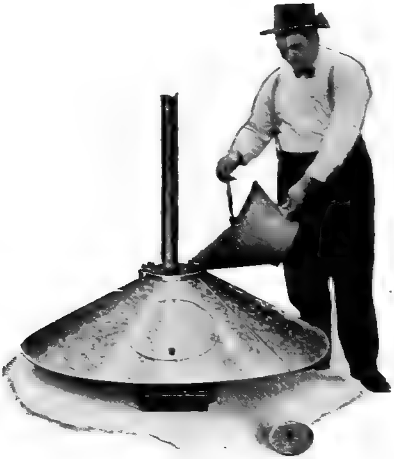


FIG. 42

The deflector of the Eureka has no curtain to diminish the circumference of the heat circle or decrease the variation of temperature the chicks may require. The stove should always be run warm enough so that the greatest number of chicks will find the degree of heat they want just a few inches outside the deflector and not under it. Your chicks, therefore, are your best thermometer. There should never be a draft on the floor. Therefore, in whatever inclosure the Eureka is used, the four sides should be

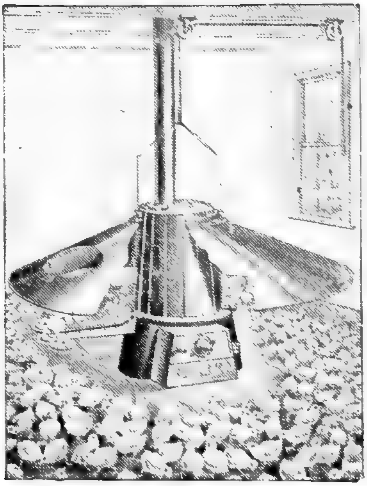


FIG. 43

tight three feet high. In brooding large numbers it is advisable to put around it a muslin inclosure about one foot high, two feet out from the deflector, to keep off all draft and prevent any chicks from straying too far away until they learn where the heat is. This, each day, can gradually be increased in size as the chicks grow older and finally be dispensed with altogether.

Fig. 44 is a Queen Colony Brooder Stove. There are no drafts on the smoke pipe of the Queen. The check rests on top of the stove and opens outward when fire is too warm, thus giving a gentle inflow of air to retard the heat. While the opening of the draft to increase the fire is located at the top of the stove, it opens into the fire at the base through an opening extending down the side to the bottom. This feeds the draft into the fire from underneath with no opening below the hover. As will be seen from the illustration, the check and the draft lids are cast together and operated together. Thus, when the fire is too hot, the wafer expands and closes the draft and opens the check, both at the same time. When it is too cool, the wafer contracts and closes the check and opens the draft. This is supposed to keep an even heat all the time, both night and day, and do it automatically.

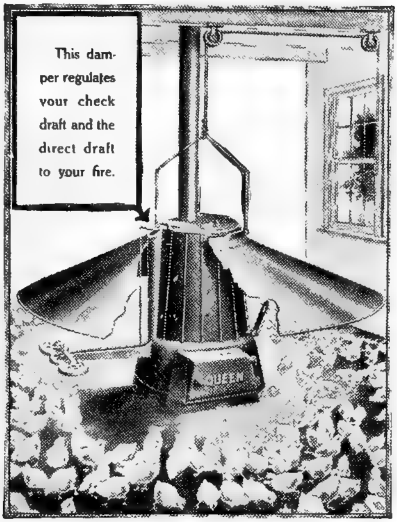

This damper regulates your check draft and the direct draft to your fire.
QUEEN

FIG. 44

The pouch feed on the Liberty Stove is illustrated by Fig. 45. Most stoves are filled from top but this shows the ease with which this is filled from the side without raising the reflector.

Coal burning hovers of this kind are here to stay. They have placed the poultry industry on a paying basis by reducing the initial cost for equipment, at the same time increasing the capacity of the poultry plant with a wonderful saving in FUEL, TIME, LABOR and OPERATING EXPENSES.

Being portable, the entire outfit can be moved from house to house as each successive flock matures, entailing less work than moving the birds. This is one of the strong features of this system, and should interest those who do successive hatching and continuous brooding.

Fig. 46 shows the various features of a Liberty Stove Brooder. One of the main features of any successful brooder is the regulator.

The illustration shows two double compound wafers arranged tandem style resting on the lower regulator arm, bolted to the base. The expansion of the wafers raises the upper arm, acting as a lever to close the draught CHECK BOX. A drop in the temperature causes a contraction of the wafers and the action is reversed. Once the adjustment is fixed, it does not have to be changed, because the growing chicks each day move away from the warm center.

The important feature is the SUPER AUTOMATIC CHECK CONTROL. Notice the wire connecting lever between the draft door and the check box. When the desired temperature is attained THE DOOR CLOSES and the CHECK OPENS ***SIMULTANEOUSLY.***

Fig. 49. Blue Hen Curtain. One of the features on the Blue Hen is its exclusive curtain attachment. Metal arms extend from the hover, holding a stout metal ring six inches away from the lower edge of the hover, all around. The curtain—looped over this ring—is easily removed or replaced in a few seconds. This arrangement makes floor drafts impossible, yet provides plenty of fresh air.

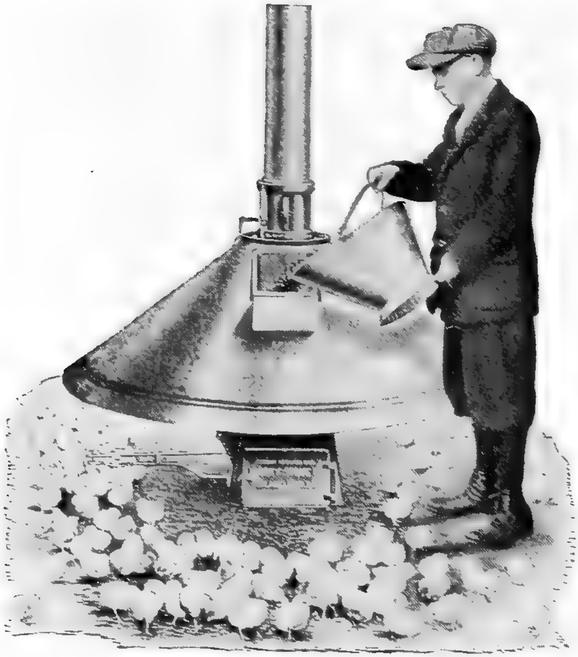


FIG. 45

Curtain Material is heavy and smooth—hemmed around the bottom so chicks can't pick at it. Curtain cannot be dislodged by accident, yet it can be instantly taken off, by loosening a few bolts.

The Hall Colony Brooder is also portable. They advise a building 10 by 10 feet in size, that faces south. This brooder is of 300-chick capacity. The hover is 3 feet 6 inches square. The brooder is heated by a small, slow-burning coal heater. It weighs about 65 pounds. It is convenient and does not take the same time that it does to fill a lamp, trim a wick, and adjust the blaze of an oil heated brooder.

Fig. 48, the Blue Hen Hover is made of galvanized iron and is shaped to deflect the heat downward. Outer edge only 9 inches from the floor so that it holds the heat down around the chicks. Hover is suspended from ceiling by pulleys and ropes—easily raised out of the way for cleaning underneath. Large circular door for convenience in tending fire without raising hover.

Fig. 50 shows the Hall Coal Heated Brooder and Hover in place ready for the chicks.

The heater in the center is 12 inches in diameter. It is widest in the center and from there down a cross-section of the fire-pot would be keystone-shaped. Around the center of the heater the hover top rests, and the inclining circular fire-pot radiates the heat out in the hover. The shape of the hover deflects the heat down upon the backs of the chicks, then passes out underneath the fringe and is distributed to every part of the house. This causes a continual slight movement of pure air under the hover which is sufficiently warm for the chicks, and enough of it is carried

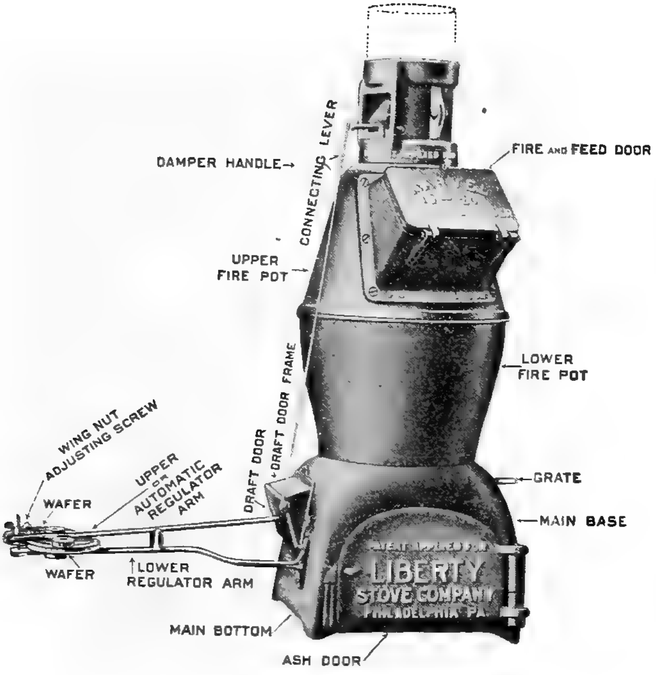


FIG. 46

out to warm the house, so that, at all times, the chicks are under good conditions for development.

Fig. 51 shows the hover raised so the stove can be looked after.

A 3-inch pipe is attached to the top of the heater and extends upward through the roof and above it sufficiently to afford perfect draft. The hover is supported upon the cone-shaped top of the small coal heater and is raised and lowered by a counter-weight attached to it by ropes. The hover is so perfectly balanced that it can be easily operated. The hover slopes from the heater to within 7 inches of the floor; this space is filled with fringe made of wool.

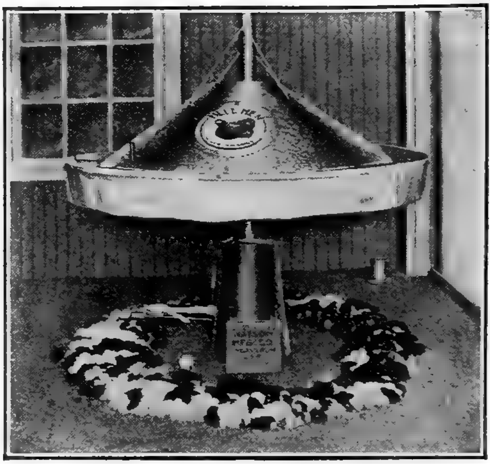


FIG. 48

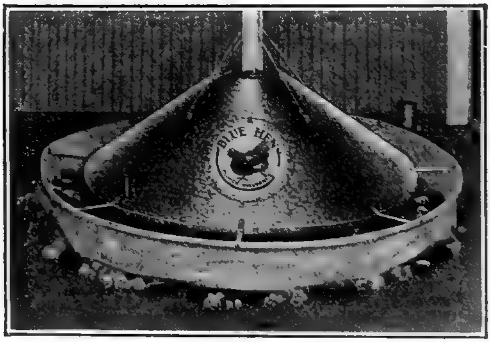


FIG. 49

Fig. 52 shows an Ideal Liberty Coal Stove Brooder. These stoves are all cast iron. The hover is adjustable, so that it can be raised and lowered; the regulator is automatic and it is so constructed as to be safe from fire. This stove can be used in any room ranging in size from 8 to 14 feet square. A coal-heated brooder can be taken care of in less time than it takes to fill the lamps, trim the wicks, and adjust the flame of oil-heated brooders. The work is done under cover; there is no exposure to the elements. The smoke pipe is attached to the top of the heater and should run through the roof sufficiently for good draft. The hover rests upon the cone shaped top and is perfectly balanced. The heat being deflected to the lower part of the room, the chicks seek the comfortable temperature and circle outside the hover.

Fig. 53 is an illustration of the Candee Coal Heated Brooder Stove. A portion of the hover has been cut away so that you can get a view of the heater, the regulator and the hover. This style of hover prevents the house from heating up. The heat is confined largely to the hover. Chicks must have some cool air. They can come to the hover when they need heat. From 300 to 500 chicks are advised for this size heater. No special house need be built for this colony brooder. A room 10x10 feet, or larger, in any house that is suitable for young chicks, is proper for this heater. It can be used in the room of almost any building that you now have. You can brood more than 500 chicks if you have a larger room. But we never recommend more than 250 to 500 chicks in one flock unless it be in a mild climate like that of California.

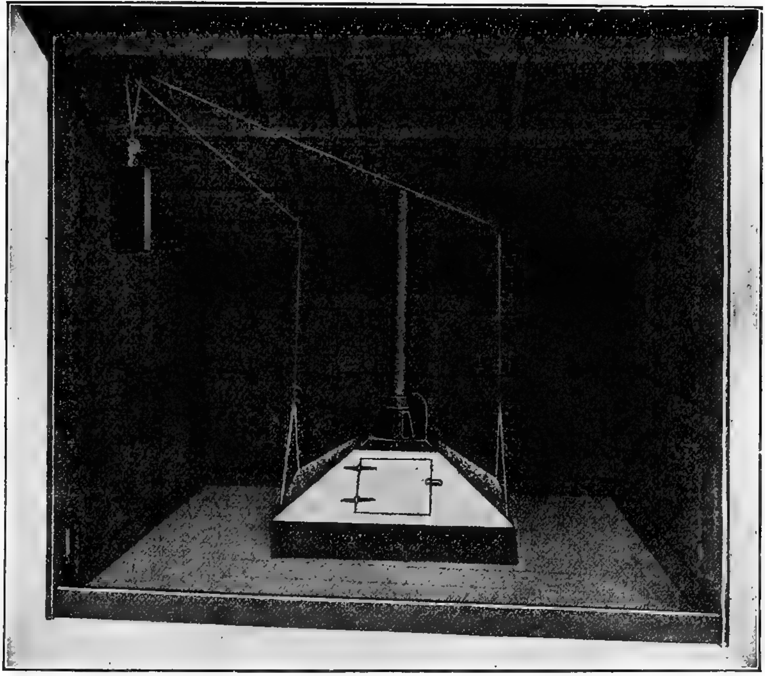


FIG. 50

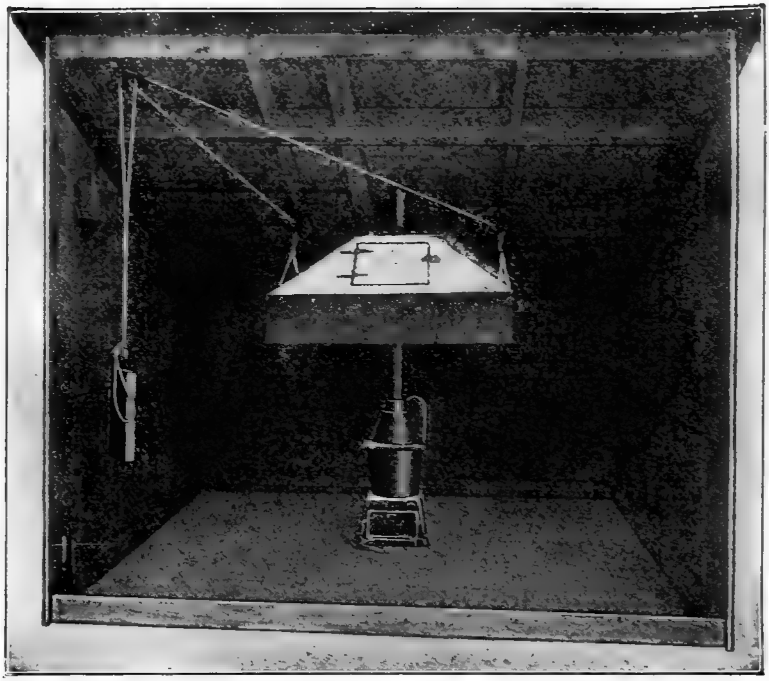


FIG. 51

**Fig. 54 shows the chicks comfortably situated around a Prairie State Coal Heated Brooder Stove. Several hundred are being brooded in the**

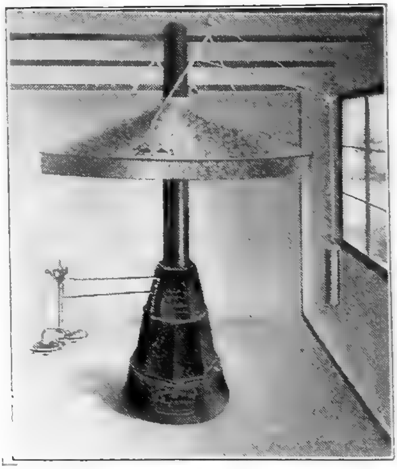


FIG. 52

**same room with good results. When it comes to feeding, watering, cleaning and disinfecting, only one house has to be visited and one trip made; thus labor is saved.**

Fig. 55. Here the operator is filling the stove. The hover is raised on the Prairie State stoves for that purpose. One filling will last for a considerable length of time. Most of these brooder stoves can be obtained in different sizes, and we would recommend that you write to the manufacturer and get the size best suited for the size of house in which you expect to use them. The Prairie State Jr. has proven one of the best and cheapest brooder stoves we have ever used.

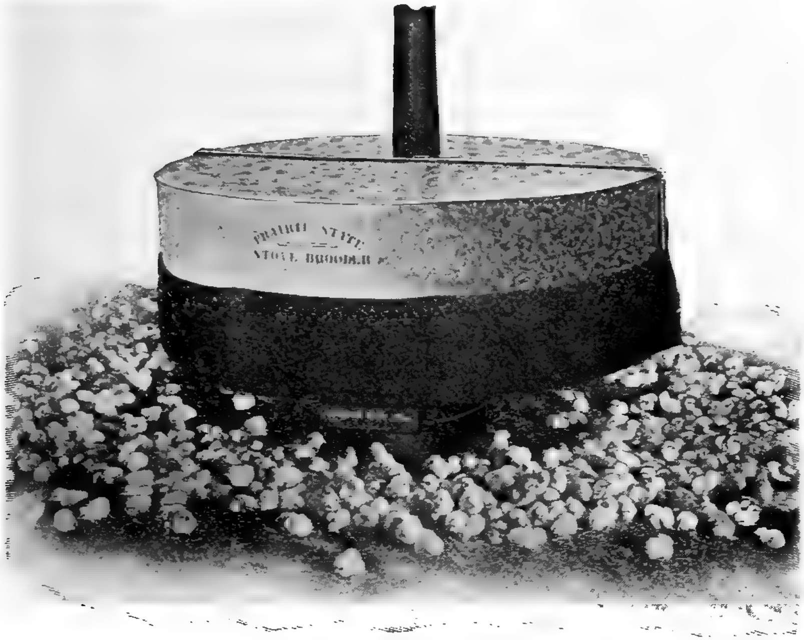


FIG. 54

## OIL HEATED BROORER STOVES

Fig. 56. This shows the radiator and deflector of the Simplex Brooder Stove. The deflector catches the heat and forces it to the floor. This is to prevent the loss of heat as much as possible.

Fig. 57. This shows the chicks at work in a room heated by the Kresky Brooder Stove. The number recommended to be carried in one lot is 1,000 as the maximum. However, as high as 1,500 are sometimes carried in one bunch, but this is not wise, in our opinion. We recommend from 250 to 500 in one room except in a very mild climate.

Fig. 58. Here is a flock of 1,000 around the stove at night. If you can get the room properly ventilated, the chicks will do well under these conditions. Don't attempt more than 250 to 500 in one flock.

We think that great care must be exercised that the burner does not clog and stop the flow of oil. The fact that the oil is fed in such a way as to be seen aids the operator. If the oil can be bought cheap, oil heated stoves give very good satisfaction. At this time when coal is difficult to obtain in certain communities these stoves are much sought, and if rightly and carefully looked after, give entire satisfaction. Getting the right amount of ventilation in a room heated by such stoves is a problem. You must take the bad air away from the floor or the chicks will wither and die when they reach the age of three to six weeks. We prefer the coal burning stoves because there is too much danger of the oil burners becoming clogged or overflowing.

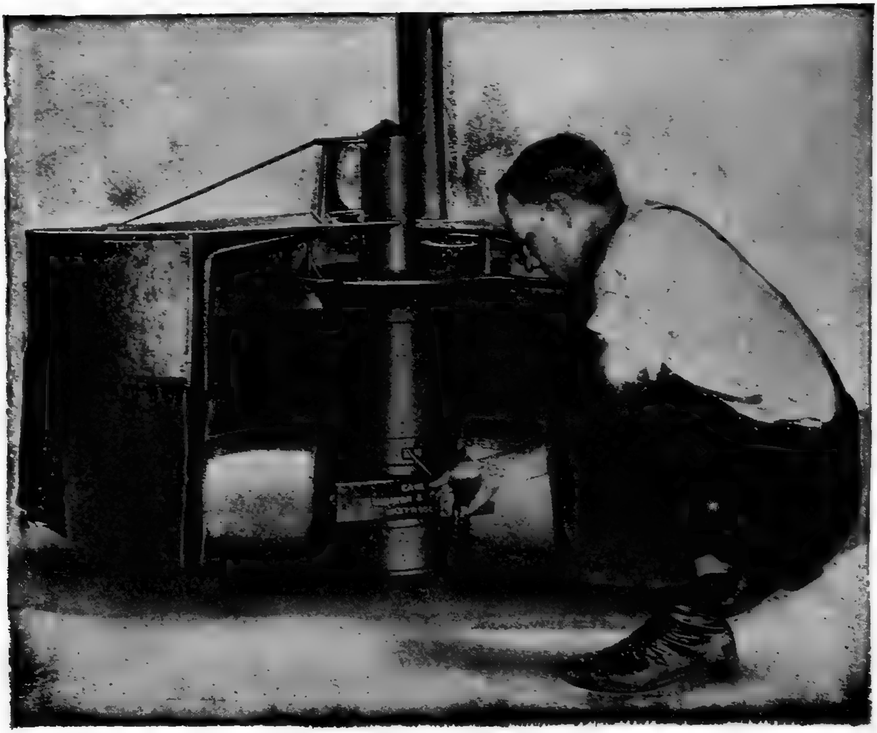


FIG. 53

Fig. 60. This is an illustration of the Kresky Automatic Oil Regulator for oil brooder stoves.

No. 7. is the cut off valve leading to the oil tank.

No. 4. is the DIAL DEGREE INDICATOR.

No. 5 the point at which the degrees are INDICATED OR NUMBERED.

No. 6 is the THERMOSTAT, which expands with heat and pushes down on the valve needle and decreases the heat and oil flow.

No. 2 is the new PATENT LOW FLAME adjusting SCREW. It is set so the point of the needle will strike it and stop the needle from shutting the oil off entirely in warm weather so when the needle is pushed down against the adjusting point you still have a small pilot light left so the flame does not go out entirely and when the weather cools the thermostat contracts and lifts the needle from the valve seat and increases the size of the flame.

No. 3 is a sight feed so you can see exactly how fast the oil is dropping at all times.

All you have to do to run this regulator is to turn the DEGREE INDICATING DIAL No. 4 until the number indicating the degree of heat you want comes under point No. 5.

Fig. 61. Is the new Kresky Oil Brooder Stove. You will note that the burner is on one side where it is easy to get to, which is a great improvement over some of the stoves which have the burner in the center. The heat passes through the heater, radiates over the chicks and out the exhaust on the opposite side. It is claimed that these stoves heat sufficient floor space to accommodate 1,500 chicks. The stove rests on a one-inch pipe.

It certainly is safer than the old style stoves, as you can see under it and there is no chance of any oil leak from careless pipe fittings that you would not see. You can get under and see under this stove at all times and see just what is doing as it rests on a single ONE INCH PIPE which

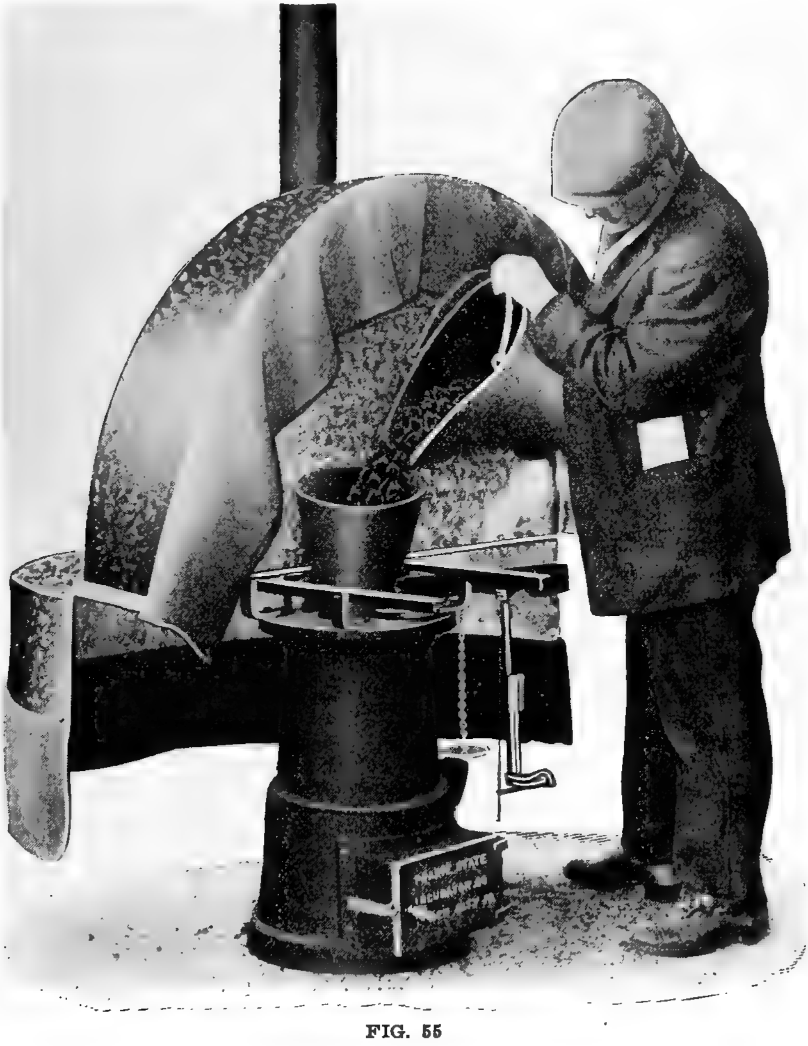


FIG. 55

screws into a FLOOR FLANGE so you can face it in any direction that will be MOST HANDY.

The whole brooder stove slides up or down this pipe and is adjustable to any desired height.

When the chicks are small and do not need such a large circle of floor heat but want the heat on their backs, you can just lower the stove as close

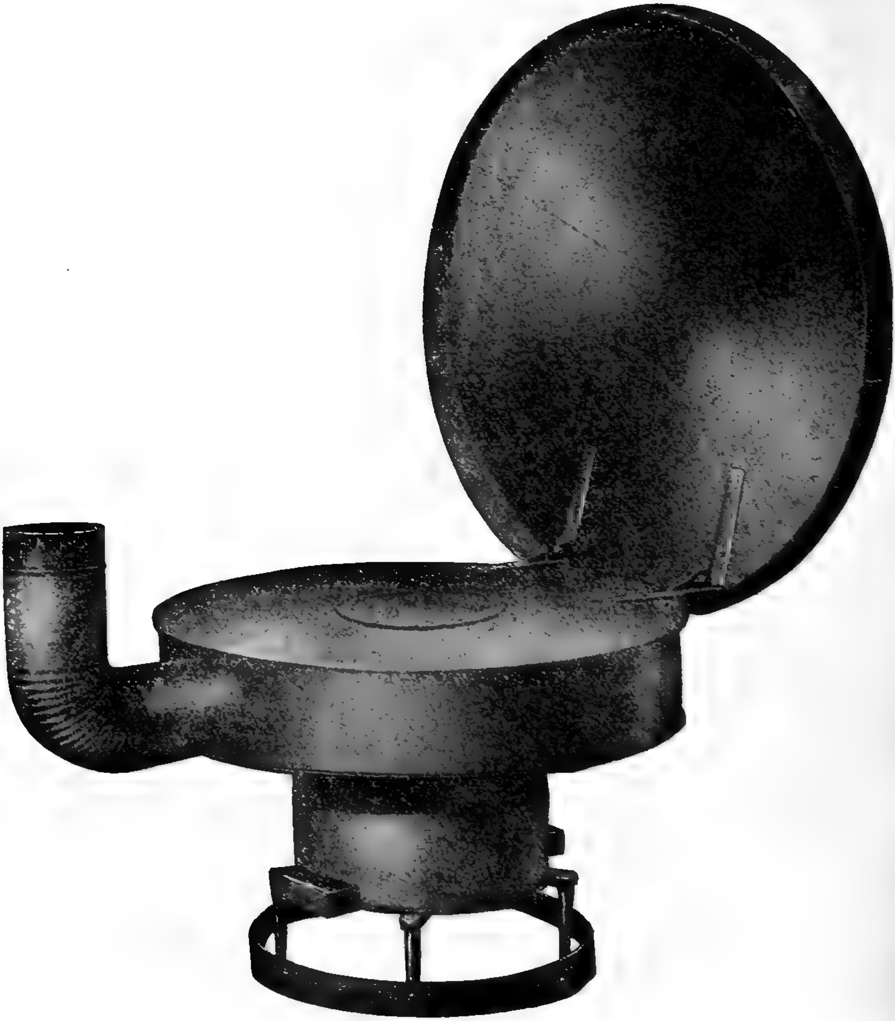


FIG. 56

to the floor as you like and practically use no oil, and at the same time you will have no chicks straying off into some corner, as they will be attracted

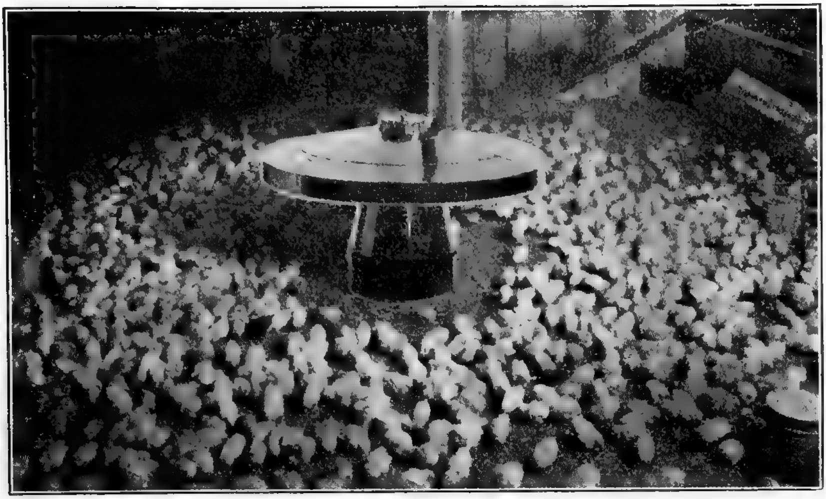


FIG. 57

DAY SCENE

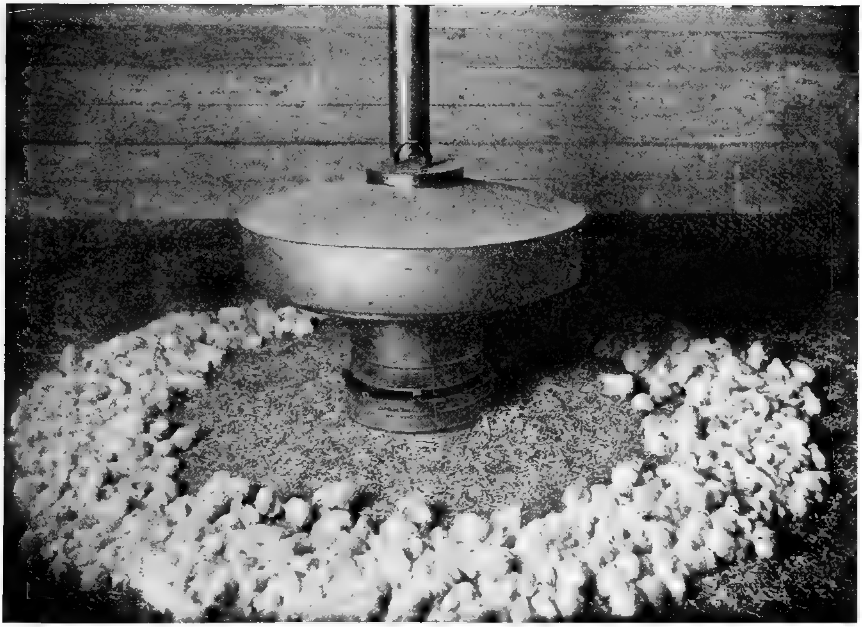


FIG. 58

NIGHT SCENE

by the nice warm floor and find plenty of comfortable heat space to accommodate them.

This makes a warming circle in the center of the room where the heat is kept just right by the AUTOMATIC REGULATOR and the rest of the room will be cooler.

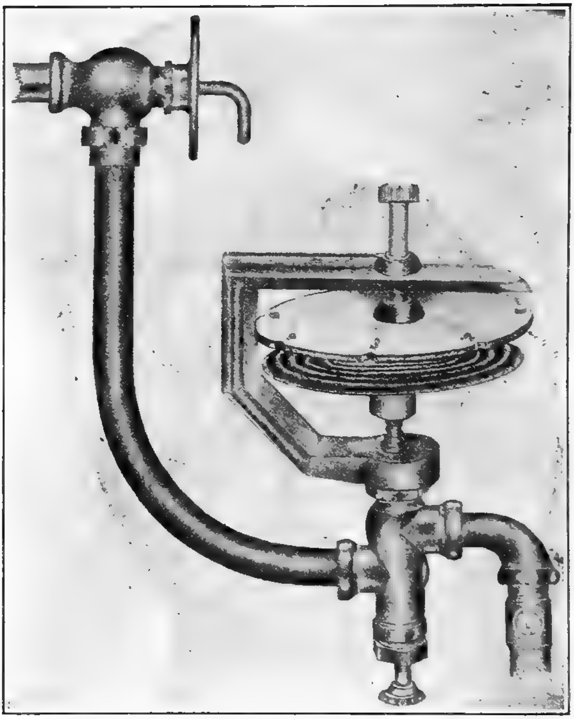


FIG. 60

This is especially desirable where the cool-room is not used. With the old upright brooder stoves the chicks did not find the nice warm floor, and in consequence would wander off and pile up in the corners, and for this reason it was necessary to heat the whole room clear into the corners for best success. As your chicks get older and need a larger floor space you can raise the stove a little higher and it will reach out further with the proper heat circle, and if desired, you can raise it high enough to heat the room to the corners.

Now suppose you only wanted to run a few chicks, say 250. You would let the stove down close to the floor, and only heat just enough floor space to accommodate the bunch.

As stated, the burner is in one of the burner boxes and naturally you would think that it would be hottest under the burner; but you will notice as the heat passes to the rear of the burner box that it passes through or rather around large RADIATING FLUES that extend through the burner box and have a radiating surface of over 145 square inches each.

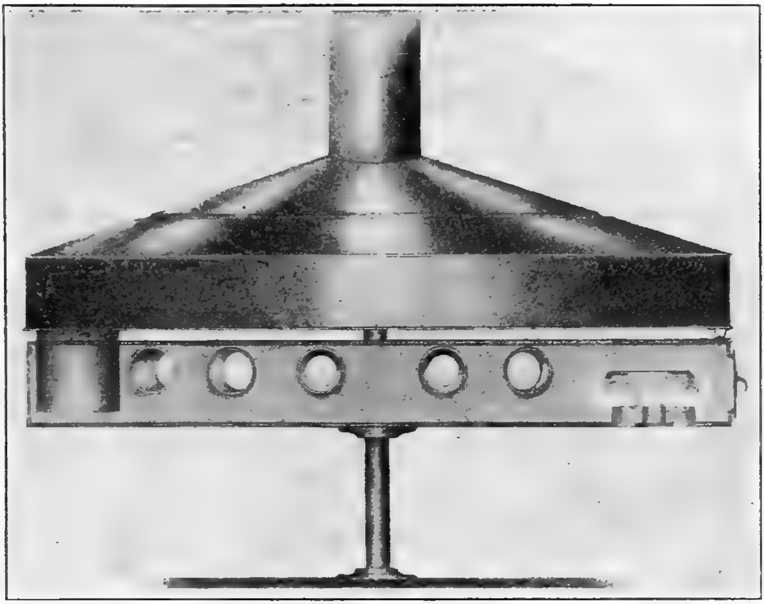


FIG. 61

They are wonderful radiators and fuel savers, as the heat coming from the burner must wrap all around them on its journey to the large radiator above.

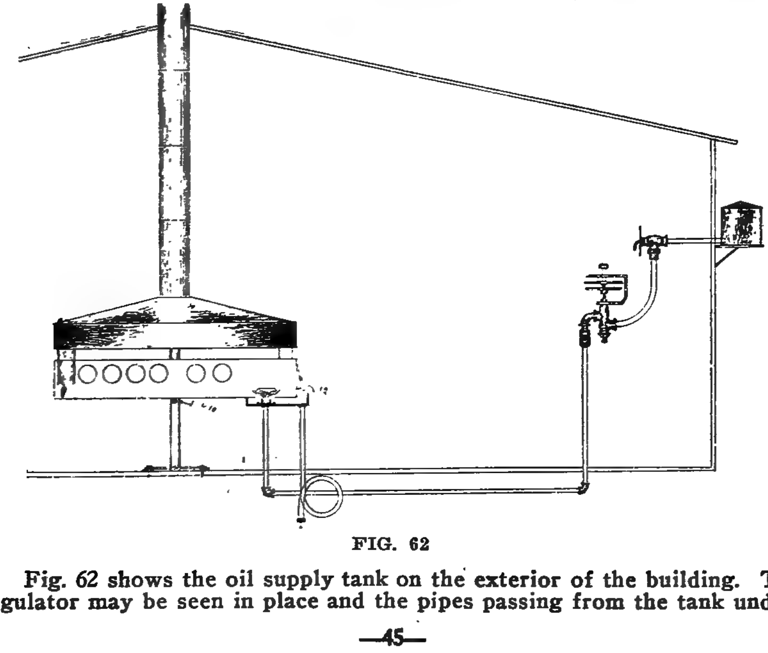


FIG. 62

Fig. 62 shows the oil supply tank on the exterior of the building. The regulator may be seen in place and the pipes passing from the tank underneath the floor and into the Kresky Oil Brooder Stove. They make the following recommendations: **USE SAND** around the stove. Don't use **STRAW** in the stove room close to the stove. Use cheap coal oil, engine distillate or stove distillate for fuel. Stove distillate is the cheapest fuel oil made outside of crude oil. Always remove and clean the feed pipe between the burner and Automatic Regulator, also the overflow pipe after **EACH AND EVERY** bunch of chicks raised, and be sure there is no sediment in the pipe before you start again. **DON'T GET LAZY AND DON'T FORGET,** as it will sometimes cost you **MONEY** if you do. **It will take just about double the amount of fuel per hour when testing the stove out, without any chicks in the room, as the animal heat of the chicks is about equal to the Brooder stove heat.** Place the thermometer about three feet from the center of the stove and about six inches above the floor, and suspend with a string from the ceiling. Give 90 deg. of heat to start with and gradually decrease as the chicks get older. You must be guided by the actions of the chicks, and don't give more heat than you have to, to keep them comfortable. NOTICE: Stove distillate may smoke and soot some in real warm weather, as the draught is not so strong then. If so, use engine distillate only in warm weather. When stove distillate is used you will notice quite an accumulation of asphalt deposits on the rim of the oil cup. This is easily raked off as it is not **CARBON,** but a kind of flaky substance and is instantly removed. Don't allow it to accumulate in the air inlets or it would give trouble. The burner will run from 14 to 16 hours without cleaning on STOVE DISTILLATE when the stove is drawing right and enough stove pipe is used to give a good draught. So you **MUST CLEAN** the burner **MORNING AND EVENING** and **DON'T NEGLECT IT.**

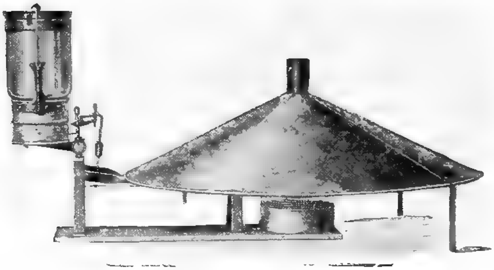


FIG. 62A

Fig. 62A illustrates one of the latest and best kinds of oil heated brooders. It is fitted with a wickless oil flame heater. There are no wicks to trim. There is an automatic sight feed which conducts the oil to the burner, a drop at a time. It is regulated by a thermostat that increases or decreases feed as the temperature varies. The objectional features of wicks, flooding, varying temperatures of many oil heated brooder stoves have been overcome in this case. Most brooders of this kind are fitted with "Sol Hot" burners. We recommend these brooders where coal is high priced and hard to obtain.

## MAMMOTH HOT WATER BROODING SYSTEMS

Mammoth hot water brooding systems have been perfected to such a degree during the last few years that they are now giving very good satisfaction. They are built in such a way that you can buy a ten-hover capacity or get fifty or more if you desire them. Where chickens are raised by the thousands, it is neccessary to have some system where they can be brooded in large numbers and do it successfully and economically. We advise all who contemplate the use of some such system as this to see that your house is properly built and that the system is properly installed. This very thing means the success or failure with this system of brooding.

There has been a vast improvement in the pipe system of heating brooders. By using a stove, the work of filling lamps, trimming wicks and lighting is reduced to one task, that of keeping the stove filled with coal that supplies the heat.

Fig. 63 shows the front view of a Candee Coal Stove for their mammoth hot water brooding systems. It has an automatic regulator, heater connections, and water draw-off.

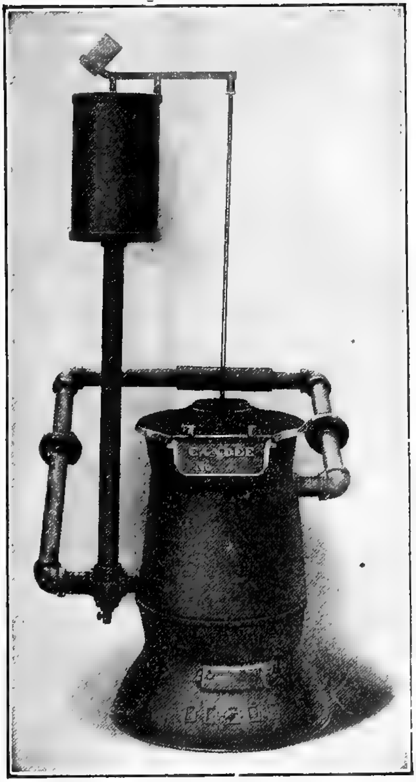


FIG. 63

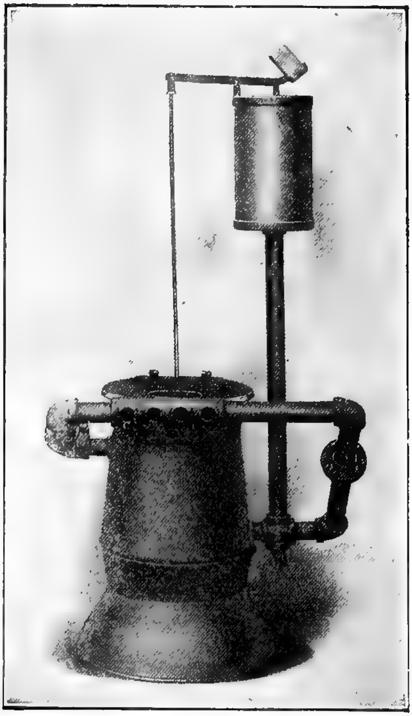


FIG. 64

Fig. 64 gives a rear view, with the heater connections where pipe runs are attached.

Fig. 65 is a cut-away view of a Candee Heating System that will give you an idea of the way the pipes run, and shows the connecting collars, radiators, and adjustable hovers.

The old-style way of heating was not a success, as the heat could not be regulated for the broods of different ages. With the system now in use, the heat comes from below and is not placed above the chicks' heads nor is the floor heated. The heat rises in the drums and is radiated over the backs of the chicks. As the chicks grow older, the drum can be turned to give the chicks more head room and reduce the heat. The chicks of all ages can be brooded at one time, but the older ones should be kept separated from the young.

Fig. 66 illustrates the Candee Hover opened so that you can see the living quarters of the chicks. The drum shows you the manner in which the heat rises and spreads over the chicks. Each hover will accommodate 50 to 60 chicks.

Fig. 67 shows the heat drum of a Candee Brooder. The hot water pipes are boxed up below the floor so as to keep the floor and to retain the heat. This drum extends down to these pipes, and the heat rises and passes

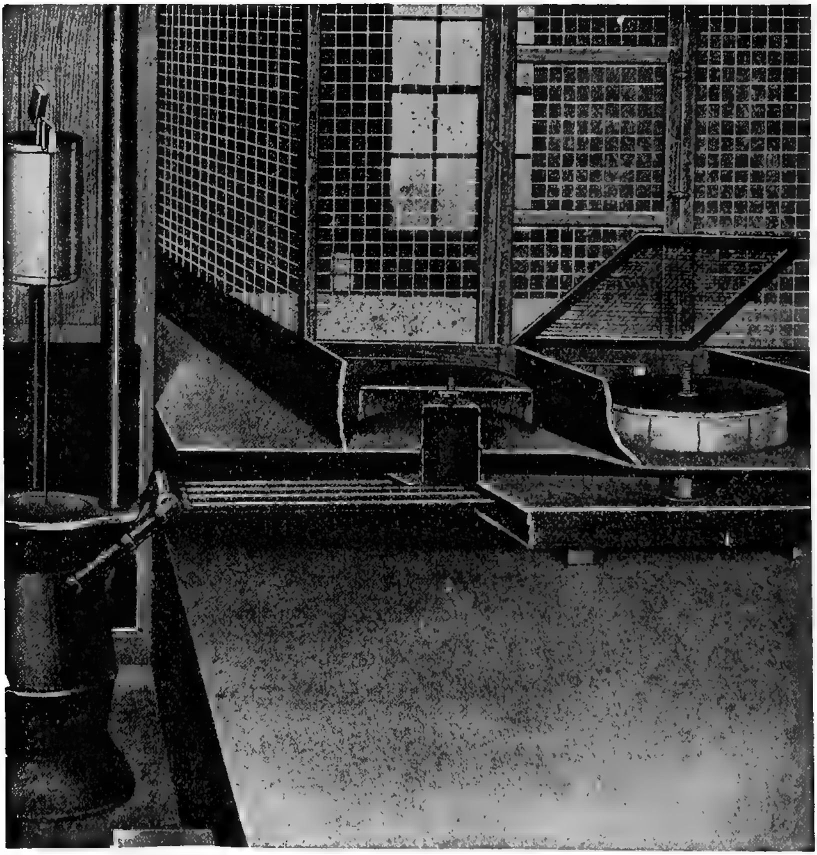


FIG. 65

through the holes in the drum and radiates down upon the backs of the chicks, as it is held there by the hover, which fits over this drum. The triangular tap on top of the drum can be sewed up or down so as to regulate the height of the hover to correspond to the age of the chicks brooded.

Fig. 68 shows two Newtown Brooding Systems. You can see that the hovers are accessible to attend it and much more conveniently located than when the brooder is inside of the run. The chicks can be watered and fed and the hovers cleaned from the alleyway.

Fig. 69 shows the radiator for the regulation of the heat going into the hover. The cast iron ring for the regulation of the flow of heat and air into the hover can be seen. One hover can be regulated to accommodate chicks of any age. This principle permits of the placing of day-old chicks in one hover adjoining the hover that contains chicks six weeks or more of age. This is quite a step over the old method.

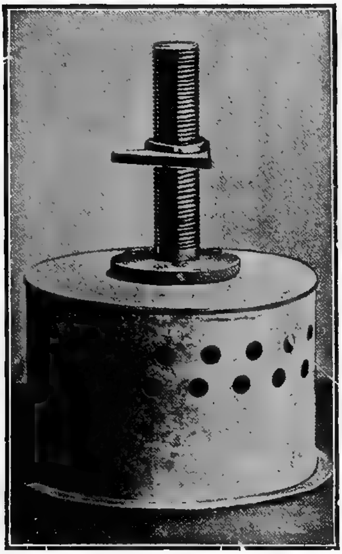


Fig. 67

Fig. 70 is an illustration of the method of the circulation of air through the ventilating holes in the sides at the bottom of the pipe box around the heating pipes of a Newtown Hot Water Brooding System.

This system insures overhead heat and a good control of its distribution. The fact that the heat can be regulated and that the pipes are so arranged that the floors are not heated affords a cool house for the chicks to exercise, whereas the old style of overhead pipes furnished too much heat for the brooder house and kept it too warm, and those that had the pipes under the chicks kept warm floors, which caused leg weakness and many other troubles.

These companies will furnish you estimates of the cost of their equipment and make your plans for a building and the plans for installing the equipment.

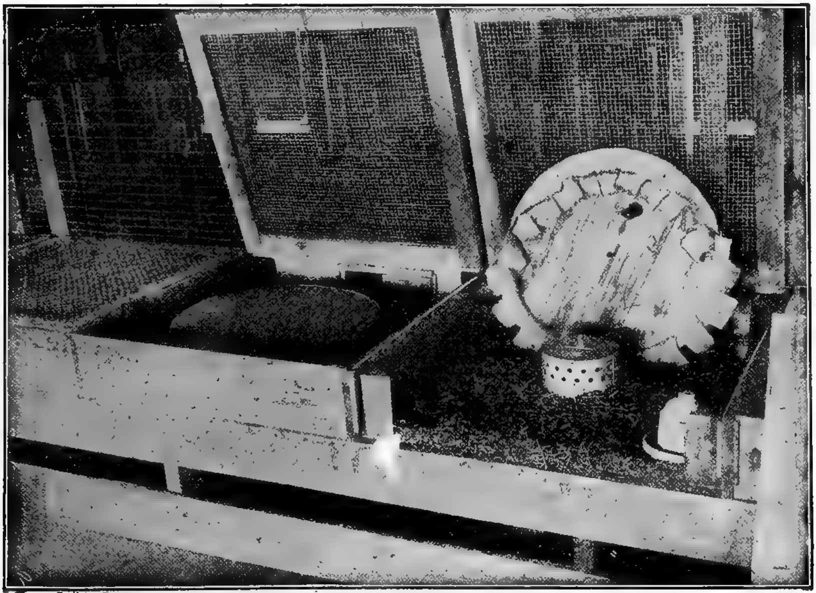


FIG. 66

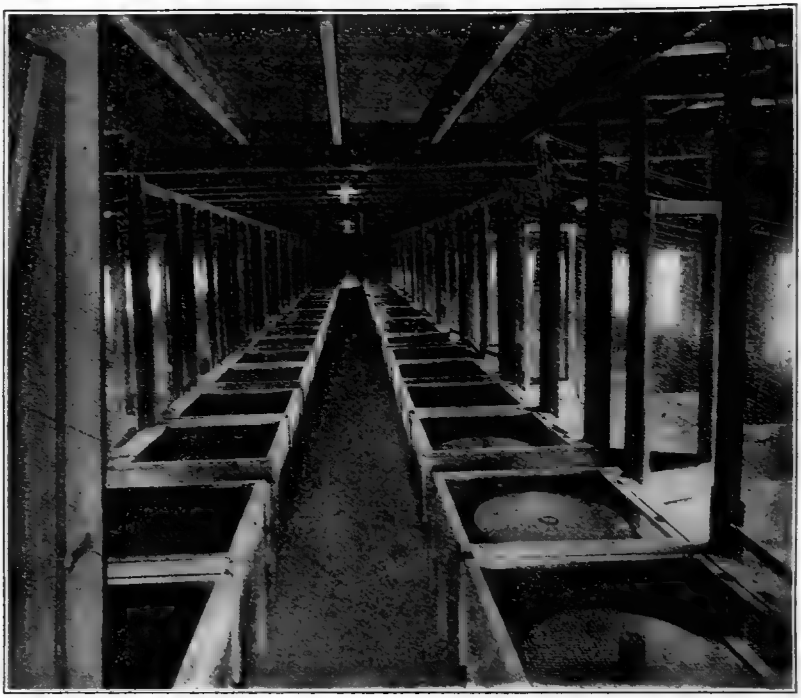


FIG. 68

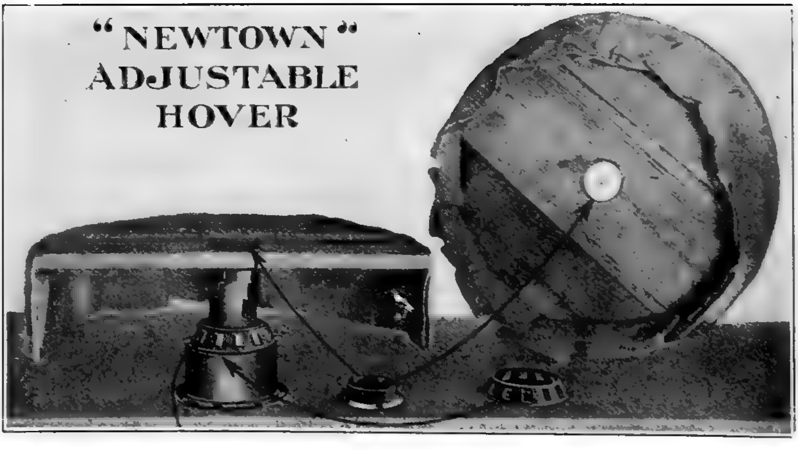


FIG. 69

Fig 71 illustrates the Hall System of brooding chicks. You can see by comparison that the general principle of heating in the brooding outfits that we are giving you is the same, but the methods of heat-regulation is different. Just as in the other two shown you, there is but one heating device, which saves labor, and the cost of coal is far cheaper than kerosene.

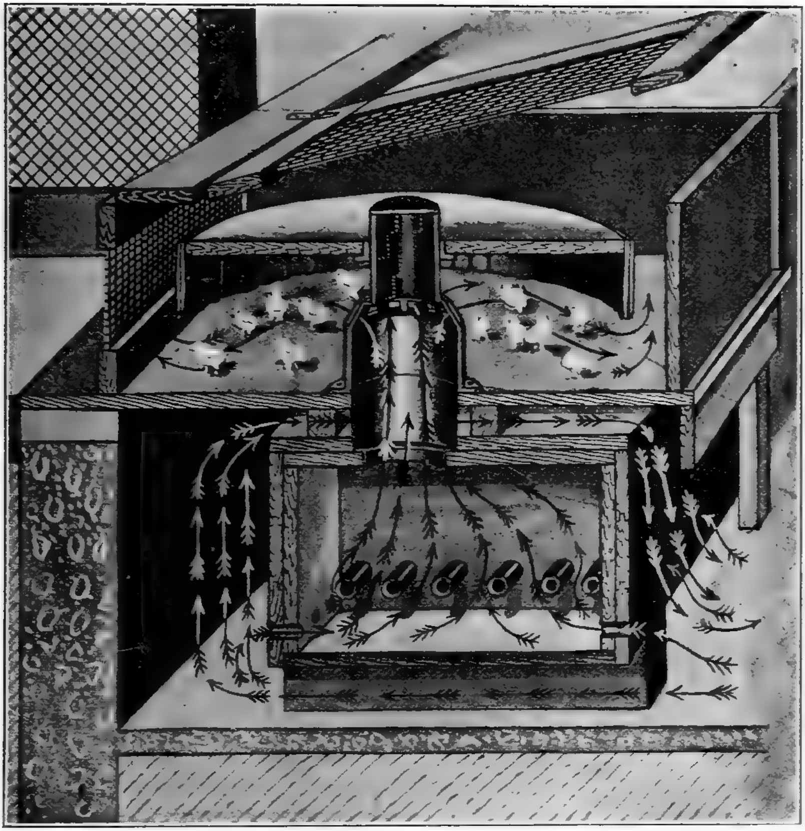


FIG. 70

The Hall people state that they have found from their customers that it costs $4.53 per week by the oil system and that by using the pipe brooder system it will cost $1 per week to carry the same number of chicks, if coal is purchased at $6 per ton.

There is less danger from loss by fire than with the oil heated brooders.

There is a pipe carrying box, divided into compartments every 3 or 4 feet, according to the width of the brooder house pens. The air enters the compartments through half-inch holes. The air is warmed by coming in contact with the hot-air pipes, and it raises through the thimble into the radiators. The holes in the top of the radiators allow a constant circulation. The air that is breathed by the chicks passes out under the felt.

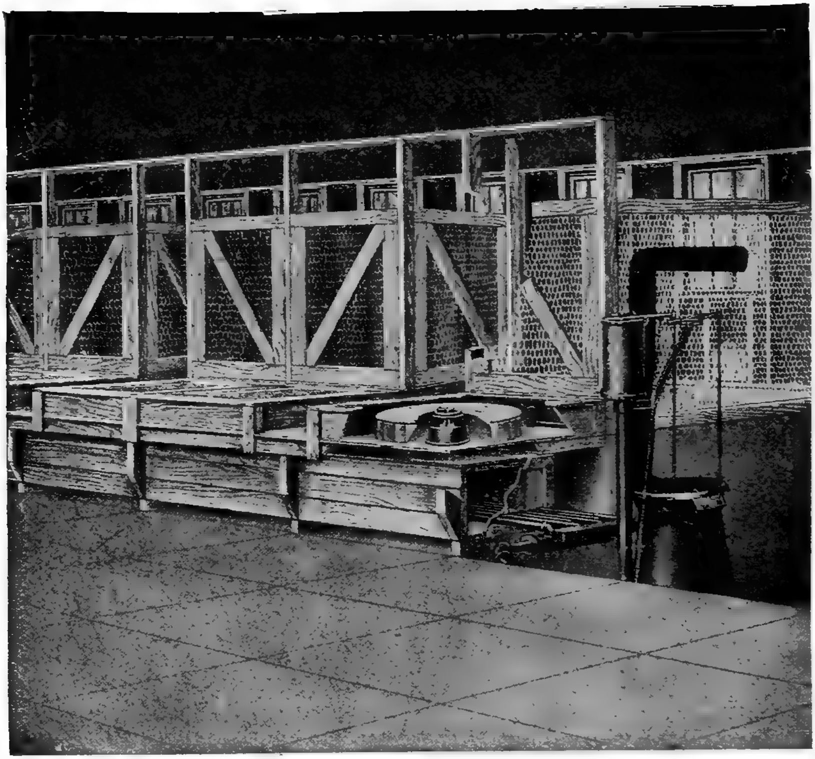


FIG. 71

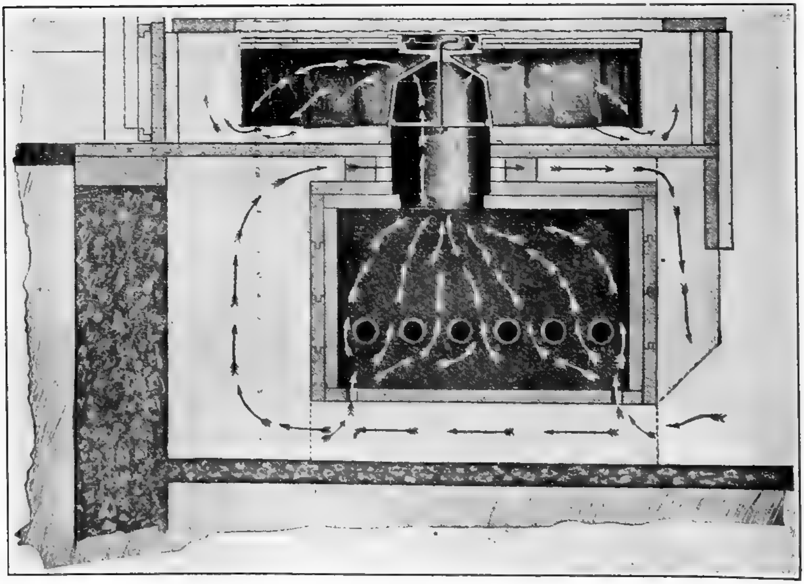


FIG. 72

Fig. 72 illustrates how the air constantly circulates around the pipe-carrying box, and between it and the brooder chamber floor.

Fig. 73 gives you the principle of the Hall method of regulating the heat. The damper is opened or closed by raising the cover of the brooder chamber and turning the damper handle. The hover fits over this damper, and the heat is radiated over the backs of the chicks.

Fig. 74. View of a brooding house equipped with a Hot Water Brooding System. This system is equipped with hovers having movable floors which can be removed and cleaned. You can see the auxiliary tank placed at the end of the hovers. This holds 70 gallons of water and holds a large amount of reserve heat. The boiler has a hot water regulator which controls the draft. The boiler is down in a small pit which is made for that purpose. The coal is also kept in this pit. Steps lead down to the pit. These pits are essential in all good brooder-hovers which are fitted with mammoth hot-water brooder systems. You get a better circulation of water, a better distribution of heat, and it is better to have the boiler and coal out of the way.

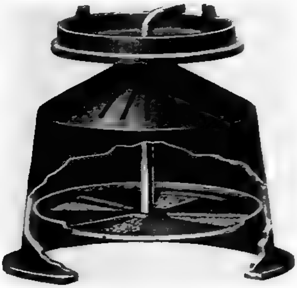


FIG. 73

## MAMMOTH BROODER HOUSES

Where it is desired to hatch chicks both early and in large numbers, a brooder house of some sort is essential. The purpose of the brooder house is to provide conditions as nearly natural as possible for chicks that are hatched out of season and that must be reared artificially. It should be

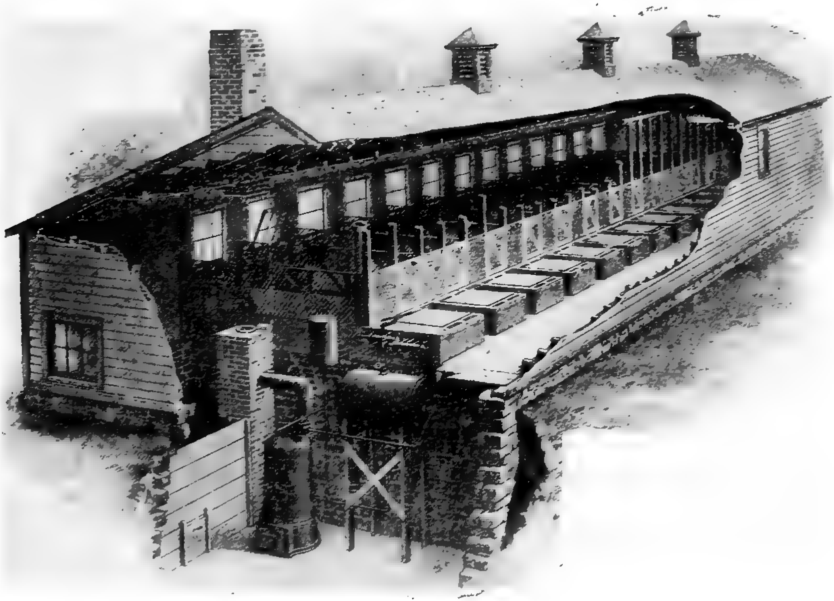


FIG. 74

made as tight and warm as possible, in order that little or no artificial heat, aside from that in the hovers, will have to be used. At the same time, provision must be made for thorough ventilation without drafts. If it can be so designed that it can be used for other purposes after the hatching season is over, so much the better. In equipping a poultry farm, the aim should be to make the largest possible proportion of the equipment yield a dividend every day in the year.

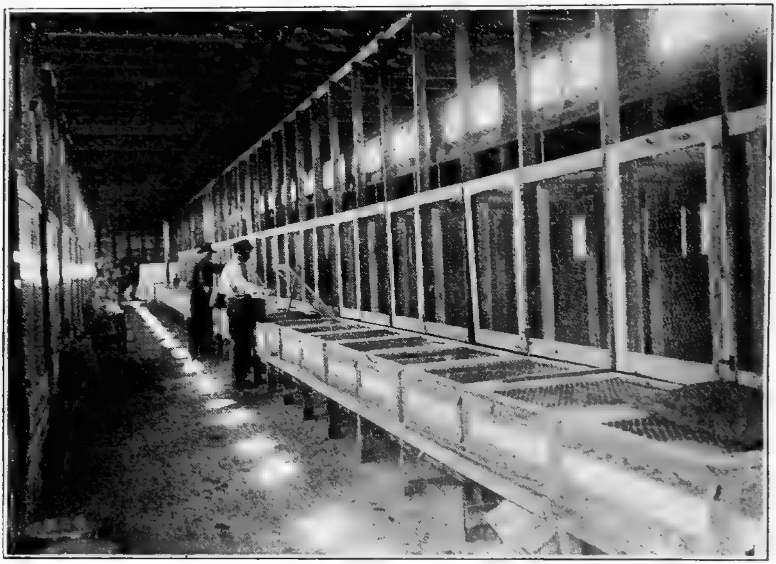


FIG. 76

**Types of Brooder Houses.**—There are in general use two different classes or types of brooder houses. The first class is permanent and is usually spoken of as the "long brooder house." These houses vary in size, shape, methods of heating, ventilation, etc., according to the ideas (and experience) of the designer. They are usually found on large commercial plants, and especially where a specialty is made of producing early broilers.

The accompanying illustrations, Fig. 75 and 76, show a long brooder house, designed by T. E. Quisenberry, and in use at the Missouri State Poultry Experiment Station. This house requires no artificial heat other than that used to heat the hovers. For this purpose the Candee Hot Water System is used, and has proven very satisfactory. While the house protects the chicks from snow and storms, the muslin curtains tacked on hinged frames to be opened in fair weather, together with half earth and half concrete runs on the inside of the house, provides as nearly natural conditions as possible. Chicks kept under these conditions become healthy, strong and vigorous, growing rapidly. When they are finally transferred to the colony houses, there is very little change in their living conditions.

The chief advantages urged by exponents of the long brooder house are (1) economy in heating hovers, and (2) the providing of ideal living conditions for the chicks, regardless of outside weather. The principal disadvantages are, (1) the high cost of building, and (2) inability to make profitable use of the building except for a small portion of the year. (One of the advantages of a long brooder house like the one here illustrated is that during summer and fall it makes an ideal cock and cockerel conditioning house.)

Fig. 76 shows an interior view of the long brooder house at the Missouri State Poultry Experiment Station, fitted with a Candee Brooding System. There is a four-foot aisle in the center of the house, with runs for the chicks on both sides, but heated hovers only on one side. We have a reason for this. The trouble with nearly all the mammoth brooding systems is that you have chickens of different ages in your hovers. Some need heat and others are old enough to do without. But if they are all kept in the runs until they are old enough to be transferred to the colony houses, and they are suddenly forced to do without heat at that time, the loss is then very great. The change is too sudden and severe. For that reason we move the larger chicks that are well feathered and strong over to the side which has no heat, and they are still comfortable because of the uniform temperature of the house. They are gradually hardened off in this manner, and we suffer no loss when they are moved to the colony houses. If you do not wish to use this plan, you can so arrange your heat drums that the heat can be gradually or entirely shut off from some pens and others remain heated.

**Methods of Brooding in Long Brooder Houses.**—The original method of supplying heat to the chicks in long brooder houses was to run hot water pipes about eight inches above the heads of the chicks, the entire length of the house. These pipes are boxed over, making brooding compartments from three to five feet square. This method of warming and hovering chicks in long brooder houses has never proven entirely satisfactory, even, under the most favorable conditions—largely because it has been impossible to properly control the temperature.

The second and more successful method of brooding chicks in long brooder houses is also by means of hot water. The pipes, however, run underneath the brooding compartments instead of above them. The pipes are carefully boxed in, so that the brooding compartment floor is never heated, thus preventing leg-weakness. In each compartment a hollow metal drum extends down to the hot-water pipes. This drum, which is perforated around the top as to let the hot air from the water pipe into the brooding chamber, extends about eight inches over the chamber floor. On the drum is placed a movable circular hover with a slotted curtain extending all the way around it. Thus we have an ideal hover, serving the same purpose as the portable sanitary hover recently described.

The third method of hovering the chicks in a long brooder house is by the supplying of individually heated brooders or hovers. Where a large number of chicks are to be hovered, this system has little to recommend it. In order to provide proper conditions an extra heated system is often required in order to keep the building warm enough, while entirely too much time and labor is required in caring for the individual lamp and hovers to make the system an economical one.

The fourth system of hovering chicks is to let them live as Nature intended them to live and come up in the fall, strong, healthy and vigorous, ready for the battle of supremacy in egg-laying contest or show-room. Each spring the colony houses should be placed on fresh ground so that there will be no danger of infection from the previous season. One of the most common causes of contagion and resulting failure in the poultry business is allowing the young chicks to use the same runs year after year. The colony house effectually does away with this trouble.

Colony houses are made in an almost endless number of sizes, shapes and styles. Some are as small as 3 by 5 feet, and are commonly called "outdoor brooders." These outdoor brooders are built warm and snug, and are equipped with lamp-heated hovers, the lamp chamber usually being on the outside of the brooder. Several incubator companies manufacture and sell

Missing Page

are hatched, and kept there until they are mature. Colony houses are inexpensive. You can start with two or three, and build more as your business grows. They can be moved about from place to place, an advantage in many ways. In early spring, while the chicks are little, the colony houses should be placed close together so that the distance traveled in caring for the chicks will be as small as possible. As soon as spring opens up, and the chicks no longer need their hover, the colony house should be dragged out along the orchard, oats, wheat and corn fields, etc.

Figure 104 shows two colony houses that have been placed end to end. These houses are in use on The American Poultry School's farm. These should be placed as close together as possible and a passage-way made from one to another. It is a good idea to make this opening as long as possible and about a foot high. Cover it with boards and roofing material so rain cannot beat in. The stove can be placed in one room and the other used for feeding and exercise. We would not advise building colony houses to use in this manner, but if you already have the houses they can be converted to good use in this way. If we had to build new houses, we recommend the double-room house in preference to the colony houses.

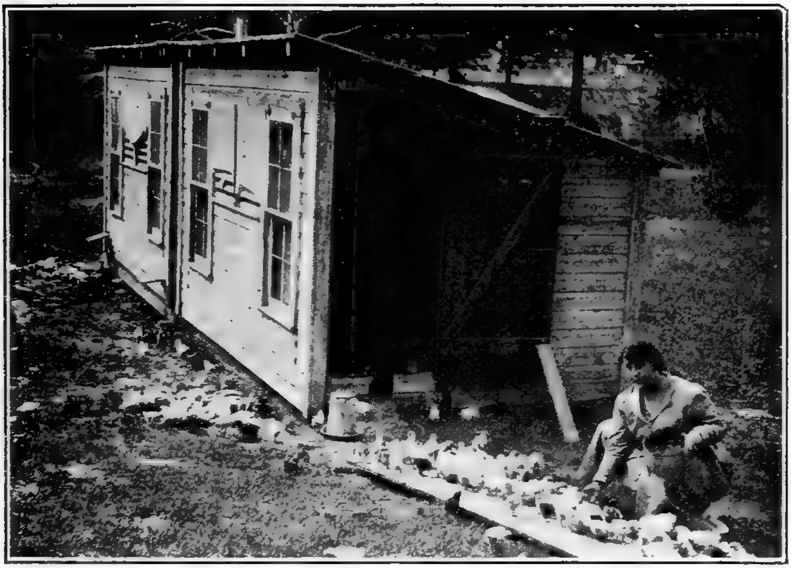


FIG. 104

## THE DOUBLE ROOM BROODER

A modification of the long brooder house, and one which is far superior to it in my opinion, is what is coming to be known as the "double room brooder." The double room brooder, as the name indicates, is merely two rooms from 10 to 14 feet square, with a specially constructed stove in the center of one room. The house should have a partition in the center and the stove on one side unless the room is 14 to 20 feet square. In that case a stove can be used in each room by placing it in one corner or near the rear. Various styles of these stoves are now manufactured, some burning kerosene and some using fine bituminous coal, as have already been illustrated. These stoves are so constructed that they reflect the heat outward and down to the floor. The chicks merely gather round the stove at the distance from it where the heat makes them comfortable. These are the coal heated and oil burning stoves illustrated and described on previous pages.

From 250 to 1,000 chicks are kept in one of these double room brooders. This system of brooding is sometimes referred to as "the poor man's friend," because both the housing and the labor cost a mere fraction of that required where the long brooder house is used. Tests thus far made indicate that the double room brooder is a decided success where the chicks are intelligently cared for and the surroundings kept in a sanitary condition. A double floor of matched lumber, with building paper between, is advisable. Abundance of light should be provided by means of windows and openings on the south side. The stove should be kept warm enough so that the chicks will not gather nearer than two feet of the stove.

A litter of fine-cut clover or alfalfa hay, or straw, about three inches deep, should be kept on the floor, and some good commercial chick feed scattered in it daily. This keeps the chicks busy and happy, and is one of the secrets of the successful keeping of a large number of little chicks together. The space surrounding the brooder stove itself should be covered with sand as a precaution against fire.

While the double room brooder is a recent innovation it is no experiment. This system is of inestimable value to the commercial poultryman who wishes to renew a large flock of laying hens each year, or to produce broilers in large numbers.

Figure 105 is a ground floor plan of a two-room brooder house. This is the ideal house for a coal heater or oil heated stove. The stove should be near the center of the heated room. Boards should be placed around the wall of this room to protect the chicks from cold and drafts, and across the corners so there will be no sharp corners for them to crowd into. You will note that the door in the partition swings both ways, and the board near the floor is for the free passage of the chicks. We recommend the use of sand on the floor of the room in which the stove is located, and straw litter or clover chaff in the cool room. The drinking pans should be raised a trifle from the floor so trash cannot be scratched into them. This method of brooding affords ideal conditions for the chicks. Two hundred and fifty to seven hundred and fifty chicks kept under such conditions will do equally as well, or if properly fed and looked after, will lose even a less per cent than where they are brooded with hens. If the rooms are 14 feet square or larger, a brooder stove can be used in each room.

Figure 106 shows the partition wall of a two-room brooder house. The door for the attendant should be on double-acting hinges so it will swing either way and always come back into position. The bottom board nearest the floor should be hinged so that it can be raised and fastened up. This permits the chicks to pass into the cool room, to get away from the heat, and to eat and exercise. This door should be just as long as the space will permit. If just a small opening is made for them to pass through, they are too apt to remain in the cool room so late in the evening when they are busy eating that dark comes on and they cannot or do not find their way back to their warm quarters. The result is that they pile up in a corner and some chill, and others are smothered. But with the large opening near the floor, this trouble is overcome.

Figure 107 shows a cut-away section and an exterior view of the two-room Fool Proof Brooder House. This house is also used as a growing house for the young stock and for laying pullets, in winter months. You can see how the stove is placed and you will also notice the boards around the room to prevent square corners and drafts. It is difficult to improve upon this system and we recommend this sort of an arrangement, feeling absolutely confident that you will be pleased with the results.

**Fig. 78.** Newtown Two-Room Poultry Building. Experience has proven that this type of building gives the most satisfactory service when brooding chicks in large numbers. Note that it is divided into two rooms. The brooder is installed in one room and the other is used as a cooler, feeding and exercising room. The building should be well ventilated and in addition to the openings in the front, a small window should be placed in the rear of each room.

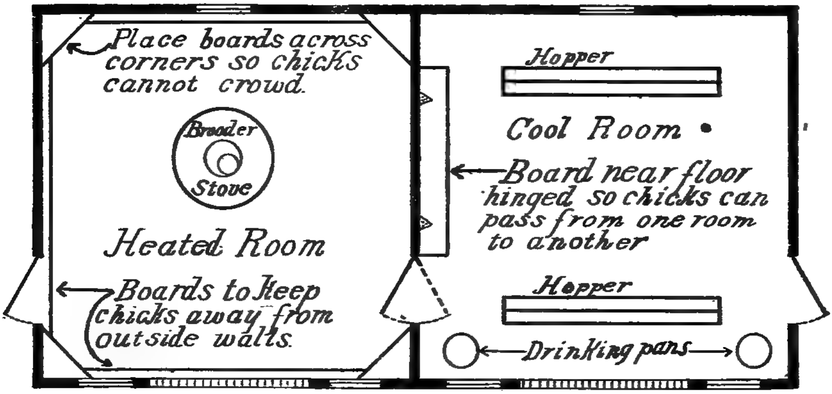

Place boards across corners so chicks cannot crowd.
Brooder Stove
Heated Room
Boards to keep chicks away from outside walls.
Hopper
Cool Room
Board near floor hinged so chicks can pass from one room to another
Hopper
Drinking pans

FIG. 105

But a larger heater should be placed in the center of the room, with the deflector sufficiently high to "spill" the heat over almost the entire floor so the chicks may spread out. This leaves little ,if any, room for exercising and chicks will not thrive if confined exclusively to this room with the temperature of almost the entire floor space remaining constantly at the same degree.

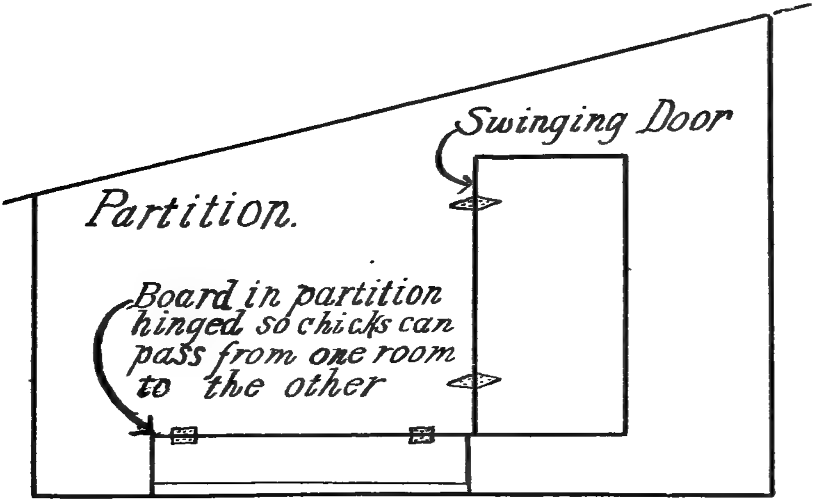

Swinging Door
Partition.
Board in partition hinged so chicks can pass from one room to the other

FIG. 106

## PARTITIONING THE ROOM FOR DIFFERENT AGED CHICKS

Where chicks of several different ages are to be brooded about the same stove it is best to separate each age by a wire partition. If the stove is in the center of the room you can run one-inch mesh poultry netting, two foot in height, from each corner of the room and let it center at the stove where it may be attached. The wire is high enough to keep the chicks apart

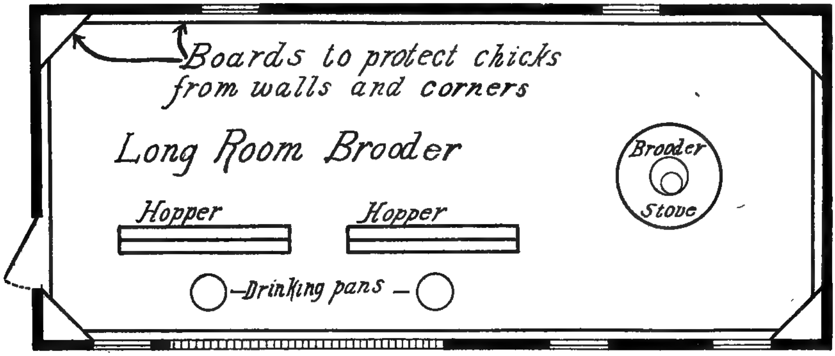


FIG. 109

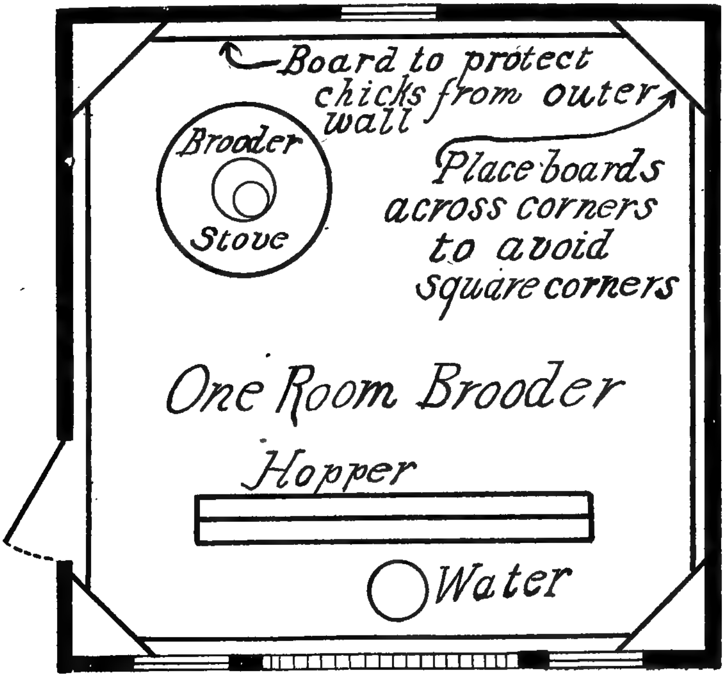

Board to protect chicks from outer wall
Brooder Stove
Place boards across corners to avoid square corners
One Room Brooder
Hopper
Water

FIG. 108

but the attendant can step over it with ease. Chicks that are just hatched may be put on one side and chicks that are two weeks old may be on the opposite side of the wire, but all brooded by the same stove.

We have had as many as four ages of chicks partitioned off in this way and all using the same stove. Partition your room so all chicks will have access to about the same warm and cool space. This sort of an arrangement saves labor, saves equipment and saves space. It also protects the younger chicks from being run over and injured by the older ones.

Figure 109 is a long, narrow room, or rectangular room used for brooder stoves. In case you wish to use the stove in a room of this kind, place the stove in one end. The other end of the house is always more or less cool so the chicks can have the advantage of different temperatures. It would be a mistake to place the stove in the center of a room of this shape.

Figure 108 is a square room that is used for brooder stoves. In case we used a room of this shape for brooding, we would place the stove rather to one side or in the corner. Then the opposite corner and the front of the house would be cool. Place boards across the corners and around the wall so that the chicks will be protected from any possibility of a draft and from the cold walls.

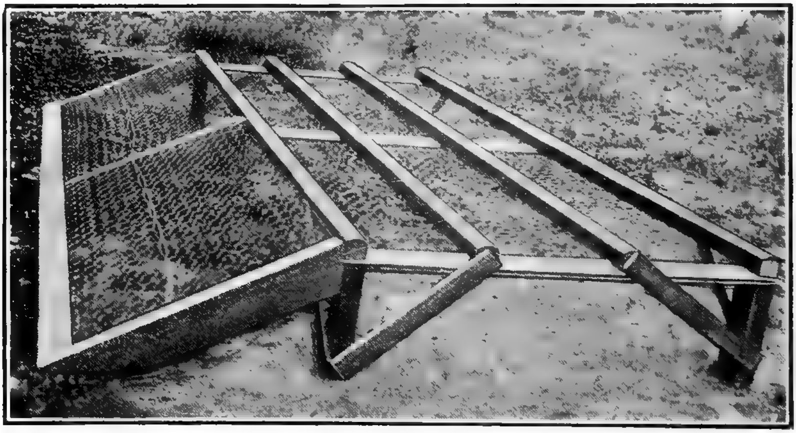


FIG. 101

Figure 101 represents a very important device which should be used by every poultryman about the time that he takes the heat away from his young chicks and wants them to learn to roost. If the chicks are allowed to roost on the floor after they reach a certain age, they crowd and the weaker ones are tramped on, and they often die by the wholesale. Colds and roup and other diseases sometimes follow. But if every poultryman will build temporary roost poles like this and cover the runway up to the roosts and the underneath side of the poles with one-inch poultry netting, the chicks will soon find their way to the roosts, and will take delight in roosting there. the proper distance apart, instead of crowding and dying in the corners upon the floor. These poles must be made just to fit the end of the house where you want the chicks to roost, so the chicks cannot drop down between the roosts and the house. Make them about a foot or eighteen inches from the floor and with a slanting runway to the first pole. The underneath side of the whole thing must be covered with the wire. This also protects the chicks from the droppings. They simply pass through the wire to the floor, then dry up and are more easily cleaned from the floor than where the chicks have trampled in them. Even if the chicks should crowd on the wire and on these temporary roosts and the weaker ones are underneath, they can still breathe and will not smother as they often do for the reason that the wire below them permits them to breathe from below, even though other chicks may have them covered from above.

But you will find that the chicks soon take to these temporary roosts This insures plenty of roosting room for each bird, they grow rapidly and their plumage is kept clean and they keep in good health at a very critical time. No time is so dangerous as when you take the heat away and are trying to teach the chicks to go to roost. This temporary roosting device solves that problem.

Figure 112 shows a temporary wire, which is one inch poultry netting, which surrounds the brooder stove in a circular manner. When the chicks are very young the wire is drawn up in a small circle so that the chicks will be confined within a reasonable distance of the stove and not permitted to get off into one corner of the room and become chilled. It is necessary, however, to have the wire far enough from the heat so that the chicks can get away from same in case the stove becomes overly heated.

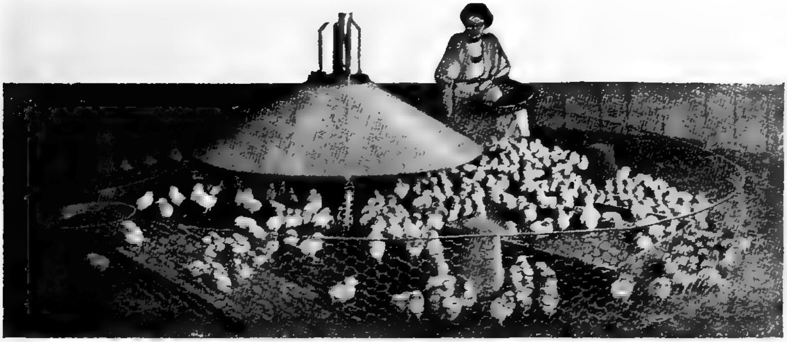


FIG. 112

The ends of the wire are lapped over each other so that the circle can be enlarged as the chicks grow older. Then the wire is finally removed from the room entirely until a new bunch of chicks are hatched and placed about the brooder.

# MAMMOTH HOT WATER BROODER HOUSES

We show in Fig. 79 the double brooder house plan of the Candee Brooder, and in Fig. 80 their single brooder house plan.

The double brooder house is usually 24 feet wide, with a central alley and a brooder system on each side. These houses run north and south. The chicks in one side get the morning sun and those in the other side get the afternoon sun. The single brooder houses run east and west and face toward the south, with the alley on the north side. The roof is built either on the shed-roof plan, a gable roof with the long slope to the south, or a semi-monitor style roof. It is better to have the brooders in a continuous row, since it requires less piping, and ample space must be allowed for the alleys.

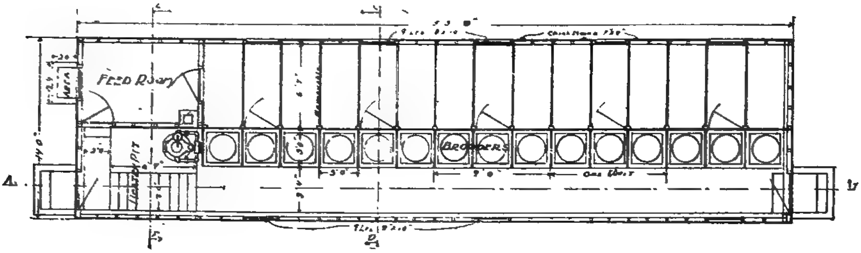


FIG. 80

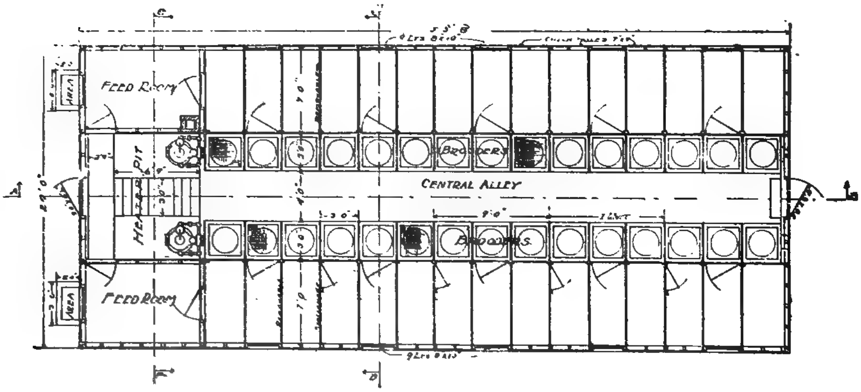


FIG. 79

Figs. 80A and 81 illustrate the floor plans for the Hall Brooding System.

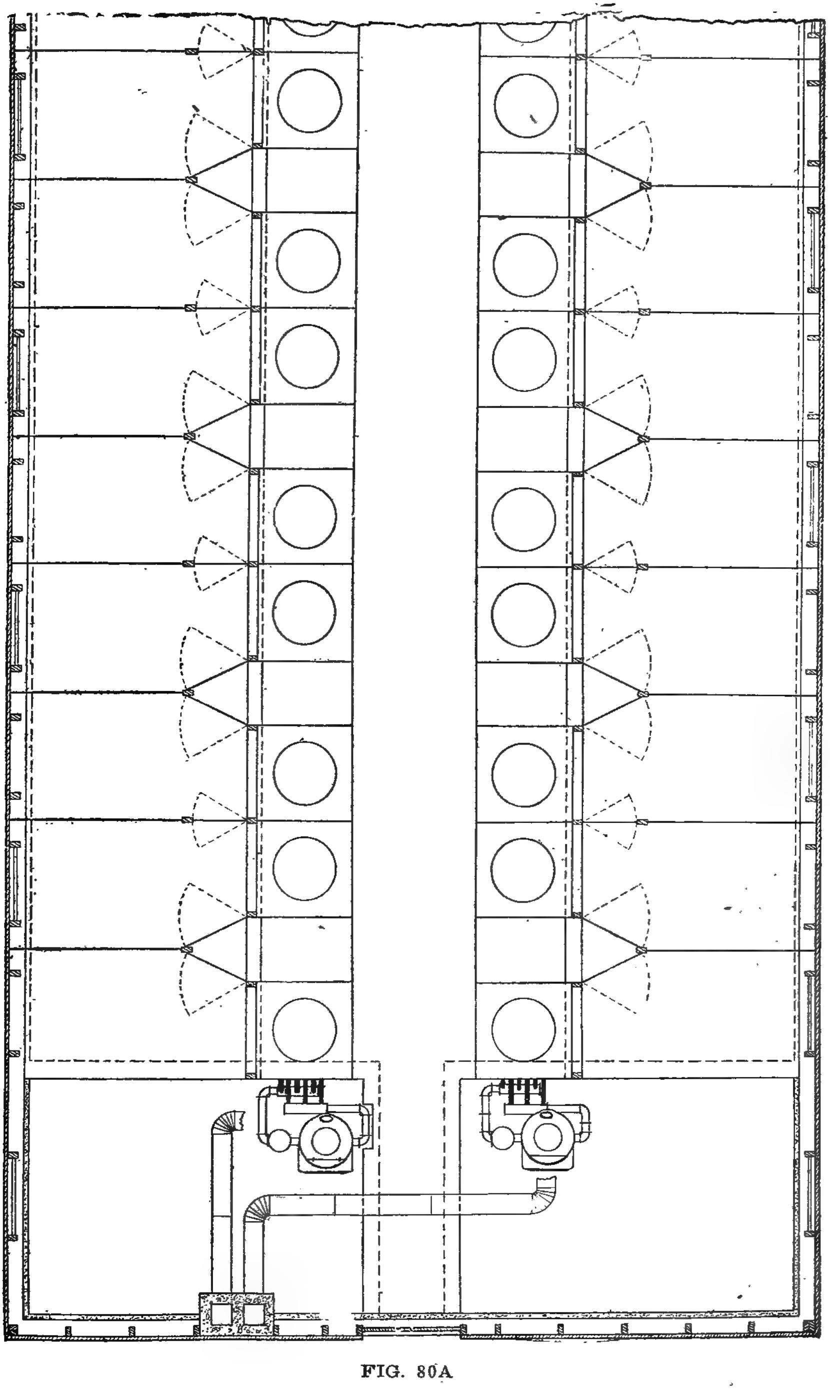


FIG. 80A

The Hall Incubator Company gives the measurements of house as 25 feet 6 inches wide. In the center heater box and depressed alley 9 feet 6 inches wide. The brooder house chambers are 3 feet wide, built over heater boy and depressed alley. The exercising pen is 7 feet long, which leaves 3 feet, 6 inches for working space in the alley. It is possible to make the house wider if preferred.

A double brooder house can not have southern exposure, but must face east and west. There is nothing to show, according to their observations, that there is any difference in the single and the double brooder system as to results in caring for the chicks.

It is possible to make the brooder houses compound so that the heaters are in the center of the house, with the brooders running in opposite directions. The plan shown is for seventy-six hovers or less. The compound brooder house will hold 152 hovers on a basis of four-foot pens.

If you plan to build a brooder house of this type, these concerns, including the Newtown, whose brooding system we are showing, will assist you if you will let them know just what you want.

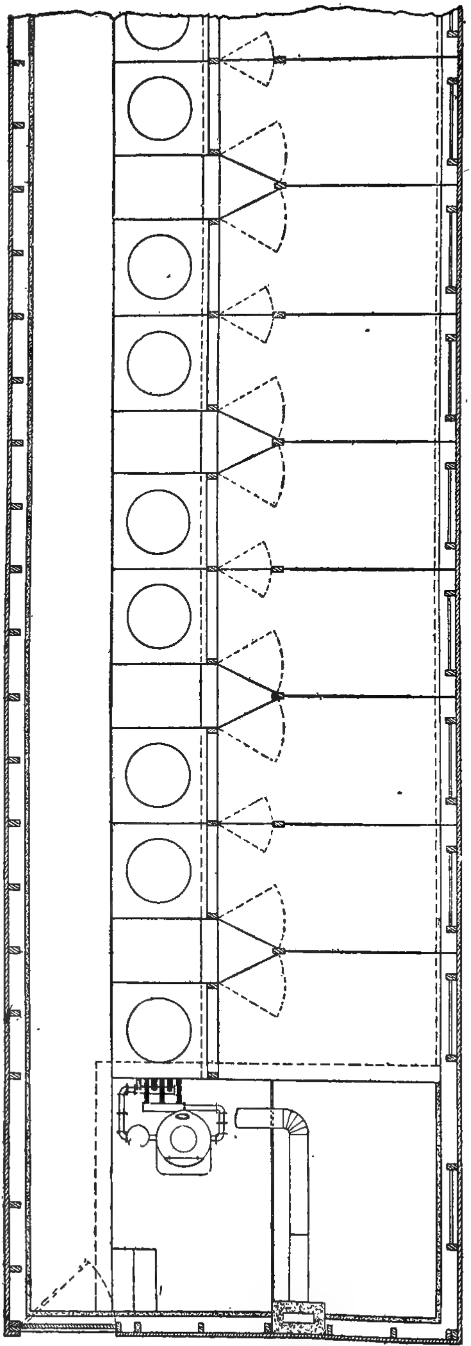


FIG. 81

Fig. 82. The house of the Yesterlaid Egg Farm. The shed-roof type. This house has no outside runs, and the chicks are kept here until they are old enough to go out on range.

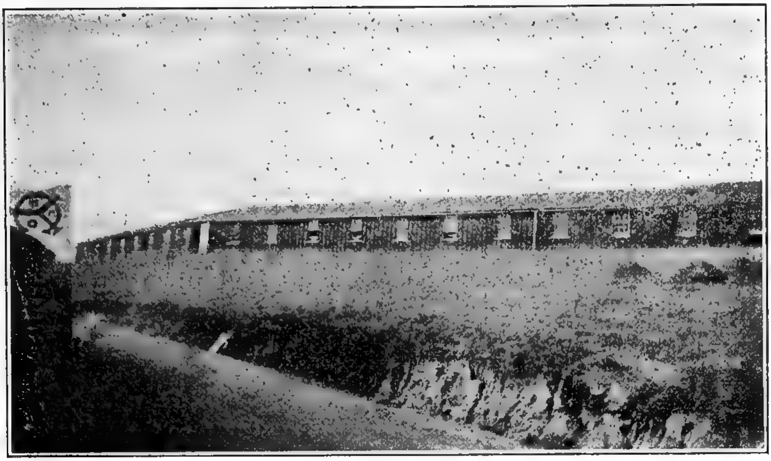


FIG. 82

Fig. 83. The house on the Missouri State Experiment Station Farm. It runs north and south and has a Candee pipe system of brooding.

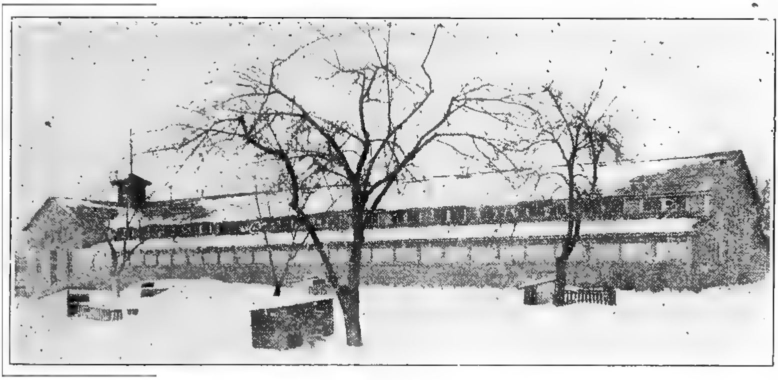


FIG. 83

## SPECIFICATIONS FOR VENTILATING SYSTEM

### As Recommended by the Simplex Brooder Stove Company.

**Lower Fresh Air Vents.**—Four of these vents are used in this system. Two in the brooder room and two in the scratching room. The two vents in the brooder room are placed in diagonally opposite corners. The two vents in the scratching room are placed in the two corners farthest away from the brooder room, as indicated on plan. In constructing these vents, first cut an eight-inch square hole in the wall twelve inches from the corner of room and three feet from the floor. Box this opening through to the outside and continue this box down on the outside of the building, to within eighteen inches from the grade line; the wind then can not have direct access to the room. Over these openings on the inside place a slide or damper, so the volume of fresh air can be regulated according to the season of the year. Be careful that these vents do not become clogged up with cobwebs, leaves, snow, etc.

**Foul Air Vents.**—There are two foul air vents placed near the opposite corners from the fresh air vents in the brooder room. These vents are six inches square and are carried down to within sixteen inches of the floor and are connected with the attic through the ceiling.

**Method of Installing Roof Ventilator "A" and Ceiling Flange "B." Fig. (85)**—First cut a twelve-inch hole in the ceiling and then cut same size hole in the roof directly above. These holes are cut twenty-three inches from the center of the room to the center of the opening for the Senior stove and twenty inches from the center of the room to the center of the opening for the Junior stove. Then place over opening in ceiling the flange or collar which will close up the hole in the ceiling after the pipe has been inserted. Cut roof ventilator "A" to fit pitch of roof as shown in Figs. 1 and 2. Place over the opening in roof and nail the flashing edge securely to the roof and then connect the smoke pipe, passing same through the ceiling flange and roof vent as indicated on plan. Be sure this pipe is put together very securely. The smoke pipe should extend at least two feet above the roof ventilator. In case higher buildings or other objects prevent sufficient draft, then the smoke pipe should be carried higher. The smoke pipe, passing through the ventilator, heats the air in the vent shaft, which will rise and cause a force draft or suction from the attic, which can not be obtained in any other system.

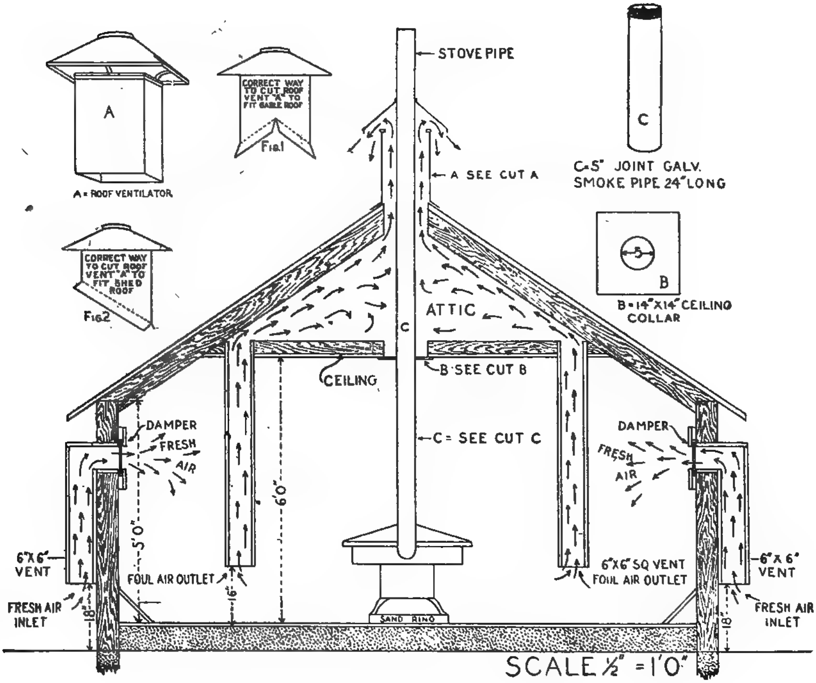


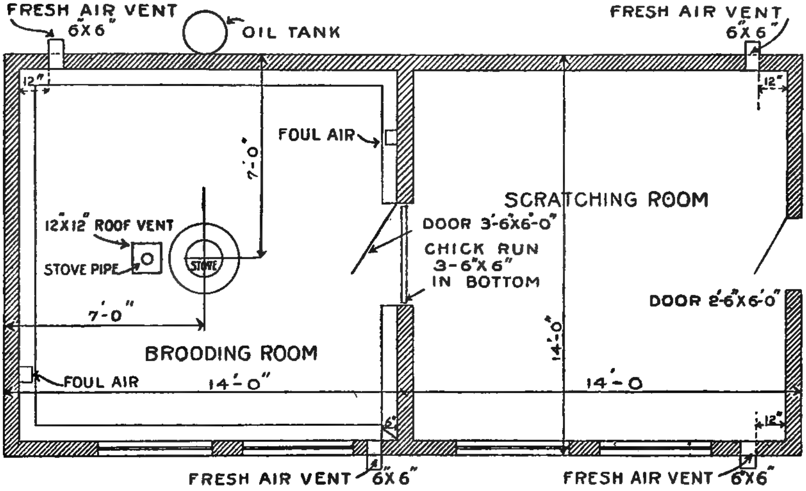
FIG. 85

**The Chicken Run (Fig. 86).**—This chicken run is shown installed at bottom of door; it is obtained by raising door six inches from floor and covering this opening to within one inch of floor with slitted burlap. At night place board over this opening, so air can not pass through, thus saving fuel: in morning open door for a short time and allow heat to pass to scratching room, close door and remove board and allow chicks this run.

**Board Around Room.**—We advise placing a twelve-inch board entirely around room, excepting door opening. Place on an angle of about 45 degrees. This does away with sharp corners, also chicks can not come in contact with outside wall.

**The Brooder Stove.**—The oil tank is placed outside of building, and the oil is conducted to stove by gravity through quarter-inch pipe. This is pipe connected to bottom of tank, passing through the wall to regulate connection; then drops through the floor, hence to center of stove. Pipe may run on top of floor for cement or wood floor.

**Windows.**—We advise placing two windows in the brooder room and two in the scratching room, size about 4 feet by 3 feet each.



FLOOR PLAN
FIG. 86

The same sort of a building and the same method of ventilation will prove good with the coal-heated stoves.

Fig. 77. This is a Fool-Proof Colony House in which two brooders can be placed. After the chicks are large enough to do without heat, the brooders can be removed and the house hauled to the range, where it can be kept until fall. Movable or portable hovers can be used in this house.

Fig. 88 shows the interior plan for these colony houses, which is certainly a nice, cozy place in which to start the young chicks, and it is a cheaper method than having to use a long brooder house that must be idle a large part of the year. For the rearing of winter broilers, this house is not so well adapted, but for the farmer who wishes to raise a few hundred chickens or for the man with a small yard this is an ideal equipment. You will notice the movable hovers on each side and the partition in the center of the house.

FIG. 90

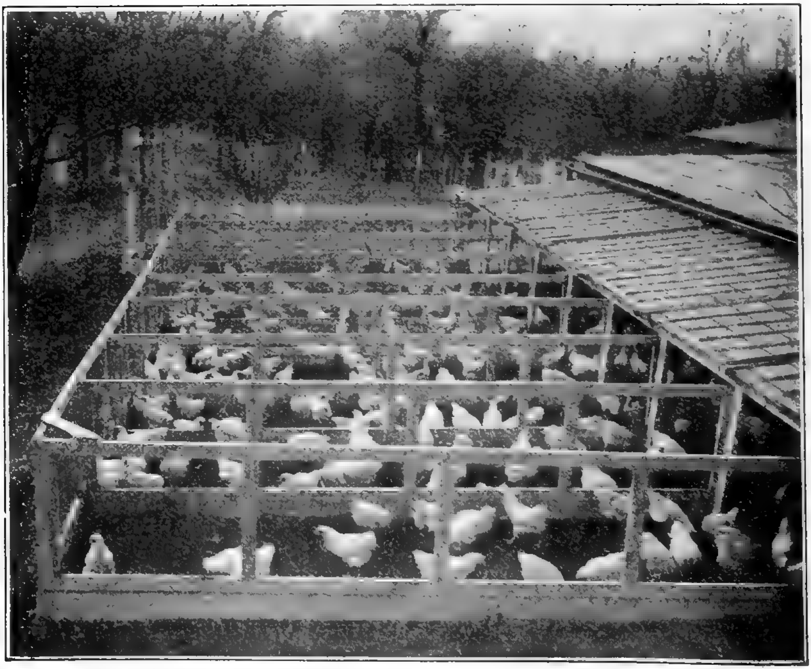


FIG. 91

Fig. 89. Here are several houses that are being used adjoining clover-fields or cornfields, where the growing stock has ample shade and can help make their own way. Certainly a better method than rearing the fowls around the back door, where the same ground is used year after year. They will be freer from disease and grow into vigorous stock if they are properly fed and cared for.

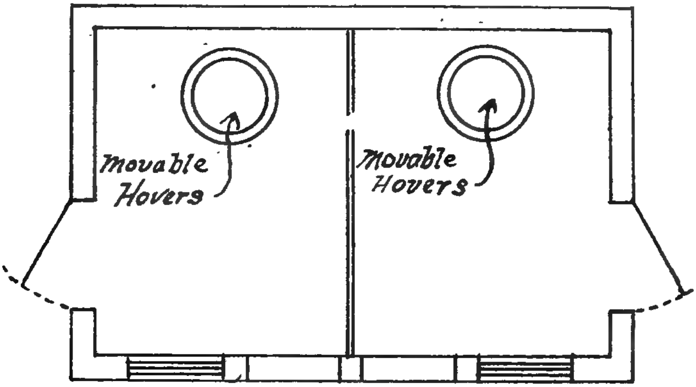


FIG. 88

Fig. 90 shows the interior of a house in which the Prairie State Portable Hovers are being used. Where such hovers are used in a long brooder house or laying or breeding house, we recommend partitioning it off, much as you see it done here.

Fig. 91 shows the exterior of a brooder house with movable runways These runways are built in sections, so that they can be removed and replaced at will.

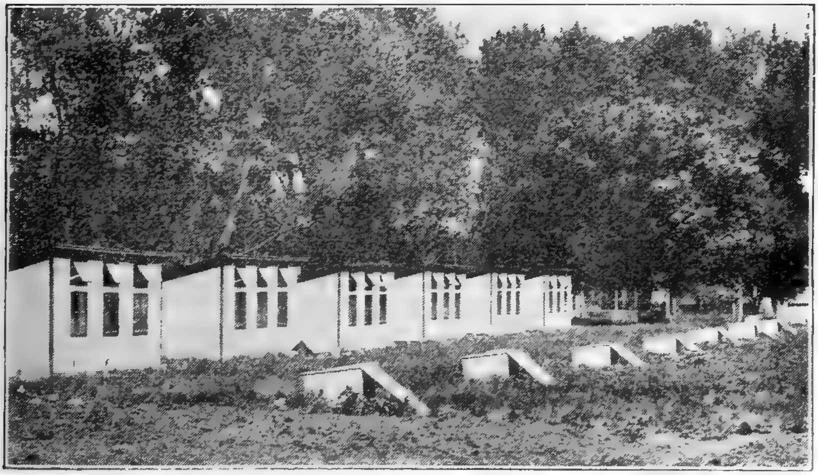


FIG. 89

Fig. 91 shows a long breeding house on the farm of Dr. J. A. Fritchey, Harrisburg, Pa. There is a feed room in the center of the building and an alleyway on the north side. The chicks have small yards on the exterior of the building, so they can get out upon the earth and into the sun. Where such runs are used, it is advisable to cultivate them occasionally, so that the ground can be kept pure and sweet and some green feed can be grown in them.

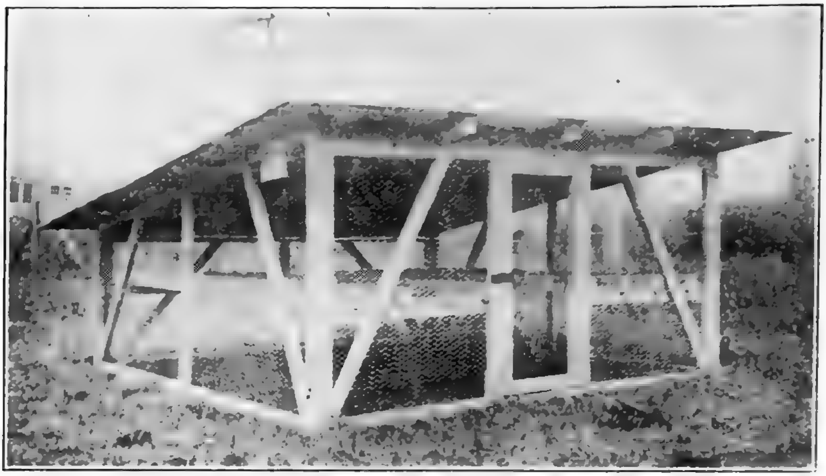


FIG. 102

Figure 102 is a summer house for growing stock. The size is about 10 by 12 feet, 7 feet high in front, and 5 feet in the rear. It is made of 2-inch framing material or even higher material is better. The roof is made in three or four sections running lengthwise of the house. The roofing boards are covered with composition roofing material, so tacked that it overlaps the joints in the sections of the roof and prevents leaks. The roof is held to the frame by hooks and staples so it may be removed.

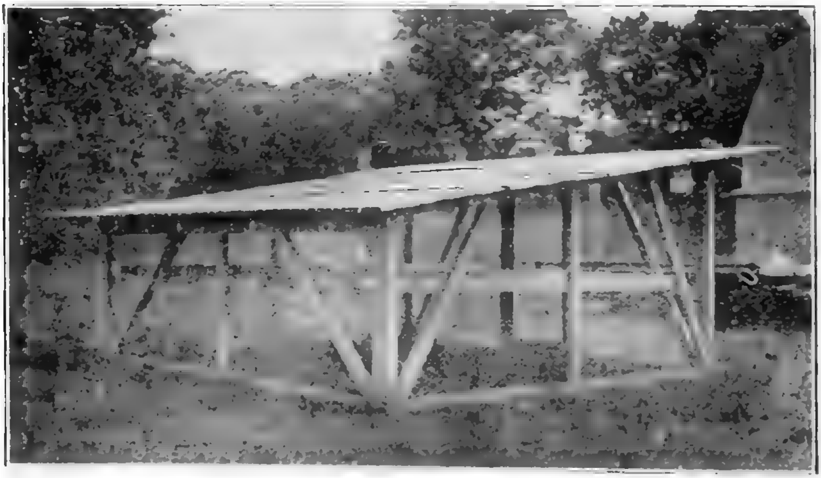


FIG. 103

The house is built in sections, the front, back and ends all being separate and individual parts. They are all bolted together with bolts, but can be easily taken apart and moved in sections. The door is in the center of the front and opens outward. The entire frame is covered with poultry netting.

The space in front of the door is open the width of the doors and the attendant can easily pass from the front to the rear of the house. The roosts are on each side of this passageway and run from the front to the back.

Figure 103 shows the rear and end of the summer growing house. The overlapping section of the roof can easily be seen. The hooks and staples which hold same to the frame are necessary to prevent the roof from blowing off. After this house has been used and the season for such houses is over, it is best to unbolt the sections, take them apart and store them in some convenient place for the next year.

## OUR RECOMMENDATIONS

**First.**—We have endeavored not to illustrate or mention any system in this lesson which is not reasonably practical and which has not given reasonably good results.

**Second.**—Where large numbers of chicks are to be brooded upon the general farm or commercial poultry farm we would recommend colony brooder stoves. At the present time we much prefer them to any other system of brooding.

**Third.**—In using brooder stoves we recommend the stove being placed to one side or one corner if used in a single room.

**Fourth.**—If chicks are to be brooded on a city lot or in a small way, heated portable or movable hovers are excellent and give entire satisfatcion. We think they entail too much work if chicks are to be raised in large numbers.

**Fifth.**—Chicks can be brooded in fireless brooders or with the mother hen, but we recommend the systems mentioned above in preference to either of these methods.

**Sixth**—Any of the heated portable or movable hovers which have been illustrated and described in this lesson we recommend.

**Seventh.**—If you wish to use an oil stove we think you will find the Sol Hot Burners, Newtown, Reliable or Kresky, some of the best. Where coal can be procured we especially recommend the Buckeye Standard stove, the Prairie State Junior or if you wish a stove of large size the Newtown, McKay, Blue Hen, or Candee will be found very satisfactory. In fact any of those, which we have mentioned and illustrated have given splendid satisfaction upon our own farm.

**Eighth.**—We have had very good success with the long pipe brooding systems. This kind of equipment is very expensive and as it can be used only during the brooding season we would not recommend that method especially for the average poultryman. Where the brooder stove is used it can be removed and the house made use of throughout the year.

**Ninth.**—It behooves every poultryman to use such methods in raising his stock as will insure the lowest per cent of mortality and the quickest growth. Brooder stoves of many kinds are upon the market and several of these are excellent satisfaction. We know of some who use two of these stoves of small size in one room. Then if one stove goes out, the other will protect the chicks and prevent chilling. For this method of brooding, we build a house 10x20 feet or 12x24 feet. The house has a partition in the center with the board nearest the floor on hinges so it can be raised as a runway for the chicks and a swinging door for the attendant. The stove is placed on one side of the partition and cool room on the opposite side is used for feeding and exercise. It is necessary to have a cool room so the chicks can get away from the heat. This is one of the secrets of successful brooding. Or you may use one room that is long and narrow. Place the stove in one end and the other end remains cool.

The houses for these brooder stoves are built just as we would build any laying or breeding house. We would not build a special brooder house which we could only use three or four months during the year and then let it remain idle for the remainder of the time. Every poultryman should endeavor to have as little equipment as possible. We locate buildings where the chicks can have plenty of range after they grow up, as soon as they are old enough to do without heat. We simply remove the brooder stove and put in temporary roosts. The chicks remain right in this house until next fall or winter when it comes time to cull them and to select the choicest for the laying and breeding pens. A flock of pullets are usually wintered in these houses. Nests can be put in temporarily until the houses are needed again for next season.

By handling the chicks in this way you avoid handling them so often, they become accustomed to their quarters, you do not check their growth by moving, and you are getting the benefit of your equipment throughout the year. It is easier and better to move the stove to another house than it is to move the chicks and have the house vacant for eight months. We know of one party who lost an entire flock last year simply because they crowded as the result of being moved six times, contracted colds and suffered in other ways.

## TO PREVENT TOE PICKING

Tack cloth over the ventilators and make the house comfortable and provide for ventilation near the floor, but avoid drafts. Be certain to provide for one cool room. If the chicks have a tendency to cannibalism and pick at one another's toes, paint the window panes with a bluish or whitish frosting. You want light in your brooder house but not the direct rays of the sun. Keep the chicks busy and active. Put some fresh earth on the floor in one corner of the room. If they show signs of developing the habit of picking at one another, grind some lean meat and mix equal parts of bran, shorts, corn meal and ground meat, with a little water just to moisten it a trifle. After it is mixed run it through a sausage mill or meat grinder and then feed it to the chicks every day. The frosted windows will do most to prevent cannibalism. Where a chick once has the toe torn it is practically impossible to prevent them from picking it further. It is best to remove the chick and keep it in a separate place. If you cannot remove the injured chick, tie up the toe, dipping it first in tar, or some good disinfectant.

## THE SECRETS OF SUCCESSFUL BROODING

A cool room is necessary or at least one portion of the room in which the brooder or brooder stove is located must be cool. Chicks will dwarf and dwindle and high mortality will result if the baby chicks are forced to remain in a heated room continuously.

In the brooder room or surrounding the brooding device a reasonably high temperature must be maintained in order to keep the chicks from piling up and smothering the weaker and smaller ones. If a reasonably high temperature is maintained and the room is comfortable the chicks will spread out and loss will not result.

Where chicks are brooded in large numbers in one room or brooder there is a great tendency to toepicking and cannibalism. If the windows, which admit light, are slightly stained or frosted so as to deaden the light this can be avoided to a great extent. What is required in an ideal brooder house or room is light and not the direct rays of the sun. When this habit is once contracted it is hard to overcome so see that your windows are frosted or tinted as suggested.

To grow into a really valuable specimen a chick should be kept growing continuously from time it is hatched until maturity. To grow chicks that will mature into a fowl which you will be proud to own requires intelligent care throughout the brooding period. There is no half way place, no period that careful attention is not required and no time when haphazard methods will fit in.

## OUTDOOR RUNS ESSENTIAL

Chicks can not be raised successfully if kept on a board floor or confined to a building for a great length of time. Out door runs should be provided and the chicks should be permitted to get out on the ground for a short while even on rather cold days. On stormy days the chick doors and windows should be opened slightly so as to provide an abundance of fresh air.

Close dead air and lack of exercise will kill more chicks than any other one evil. Fresh air is a life saver. Many poultrymen nurse their chicks too closely and many of them are killed because they are not hardened to or permitted to enjoy out door runs.

## KEEP THE QUARTERS CLEAN

If sand or soil is used on the floor in which the brooder stove is located you usually get better results than where straw is used in your brooder room or some other form of litter. But whatever is used it is necessary to keep the chicks' quarters clean. If filth is allowed to accumulate trouble will result sooner or later. The quarters must also be kept perfectly dry. If small runs are used remove the new runs often. It is a good idea to plow up and disinfect the old ground by stirring in air slacked lime. Plant the runs to wheat or oats or sweeten the soil by growing some other form of green food and this also furnishes a fresh crop of green food for the chicks.

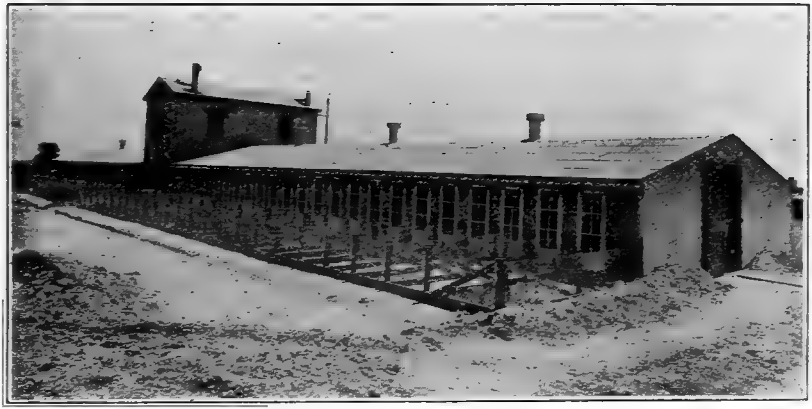


FIG. 92

## QUESTIONS ON BROODING?

### Lesson No. 18

1. What is the real test of the merits of any brooding system?
2. Why is it necessary with any brooding system to provide plenty of room for exercise in the brooder or brooding-house?
3. Why is it unwise to invest too much in a brooder house or system at the very beginning of our career as a poultryman?
4. Name five essentials of a good brooder.
5. Why is it better to have the temperature a little high, rather than several degrees too low?
6. How can you tell when the chicks are comfortable?
7. What would indicate to you that the chicks were uncomfortable?
8. Is it necessary to maintain the same degree of heat throughout the life of the chicks? If not, when can we begin to reduce it?
9. What kind of material should be used for litter?
10. Why is the proper ventilation of a hover or brooder very essential?
11. Why is it sometimes dangerous to allow the direct rays of the sun to shine into compartments where baby chicks are being brooded?

12. If you expect to raise chickens in large numbers, what things should you consider in investigating and adopting a brooder system?

13. What more is required of the person who broods chicks in large numbers than of the one who broods them in small flocks?

14. How large a number of chicks should a farm produce yearly before it would be justified in installing a mammoth brooding system of some kind?

15. What precautions should be taken each time before placing a new lot of baby chicks in a hover or brooder?

16. After the season has closed, what care or attention should the brooders and hovers receive?

17. What is the theory of the fireless brooder?

18. Do you recommend the use of fireless brooders for poultrymen who wish to raise poultry on a large scale?

19. What objection can you offer to the use of galvanized iron for poultry houses, roofs, hovers or brooders where they are not artifically heated?

20. What advantage has the wire rat-guard besides that of protecting the chicks from the rats?

## BROODING BY NATURAL METHODS

**Natural Brooding.**—As the term indicates, "natural brooding" means "brooding in Nature's way"—the hovering of the chicks by the hen that hatched them. Where the chicks are only raised in comparatively small numbers, natural brooding is undoubtedly the most satisfactory; where they are raised in large numbers, the expense of cooping the broods and the labor in caring for a large number of hens and chicks, even if the desired number of hens could be obtained, make artificial brooding preferable to natural brooding.

The success of natural brooding depends in a very large measure upon the variety of the mother hen as well as upon her individual nature. Hens of the small "egg-laying" varieties, such as the Hamburgs, Leghorns, etc., are too nervous and excitable to make ideal mothers; hens of the heavier Asiatic varieties, notably the Brahmas and Cochins, are, as a general rule too big and clumsy to make ideal mothers. The best mothers are hens of the so-called "general-purpose varieties," such as the Plymouth Rocks, Wyandottes, Rhode Island Reds, and Orpingtons. Even in these varieties there is a wide variation in the natural adaptability of hens as mothers. The mother hen should be quiet and docile, careful in her movements, and of the kind that tends strictly to business. The hen that is wild and excitable, or that is cross and flies into a rage every time you approach her, should not be tolerated for chick raising purposes.

The principal advantages of natural brooding over artificial brooding are that the mother hen cares for, hovers and protects the brood better than it can be done artificially. There are several disadvantages, however. The time of hatching depends upon the whims of Biddy, rather than upon the requirements of the business. There is more danger from lice with hen raised chicks. Where a large number of chicks are to be raised, natural brooding is too expensive.

**Preparing for the Brood.**—The most important preparation for hatching time is to see that both the hen and the nest are clean and free from lice and mites. The hen should have been dusted with a good lice powder when she was set and she should be dusted again on the seventeenth day. As an added precaution, it is a good plan to change the nesting material at the time of the second dusting, so that everything will be clean and fresh.

The brood-coop for the hen should also be prepared in advance. If it is an old one, used the year before, it should be thoroughly cleaned, disinfected, and allowed to dry in the sun.

**The Brood-Coop.**—If a new brood-coop is to be made, don't wait until the last minute and then hastily throw together a mere excuse for a brood-coop. A brood-coop, properly constructed and painted, will last a lifetime and will prove a splendid investment; a cheap, poorly constructed one will be dear at any price.

A good brood-coop is one which fully protects the brood from wind, rain, and natural enemies and at the same time provides good living conditions—i. e., room, light and fresh air without drafts.

Cheap, commodious and serviceable brood-coops can be made from dry-goods boxes which can usually be purchased for a nominal sum. Boxes best adapted to this purpose are 3x3x3 feet or more. Saw the box near the center at an angle of 45 degrees, thereby making two coops from each box. Cover the sawed part over with boards and cheap rubber roofing of some sort. Two openings should be made in the front—one a door, and the other an opening for light and ventilation. The upper opening should have hail-screen tacked over it to keep out rats and other vermin. Hinged at the top of this opening, and opening outwards, is a door the same size as the opening; this door is propped open little or much according to weather. It protects the front of the coop both from rain and hot sun.

Two doors should be provided—one a solid door to close at night and the other of slats, so that the chicks can go in and out while the hen is confined. If desired, the roof of the coop can be hinged to facilitate cleaning and sunning.

**Provide Lath Runs.**—Experience and careful tests show that it is a mistaken idea to allow hens to run at large with their chicks for the first ten days or two weeks after being hatched. The chicks should be allowed to range at will, but the hen should be kept confined in a slatted run, where she can get out on the ground. Where this system is followed, the chicks are always in a place of safety in case of sudden storm; they are not taken into dangerous places nor compelled to go distances too great for their strength. The result is that they do better, and a larger per cent of them are raised. Move the coops to fresh ground every few days. After the chicks are ten days or two weeks old, it is often advisable to let hen and chicks have free range, coming back to coops only at night.

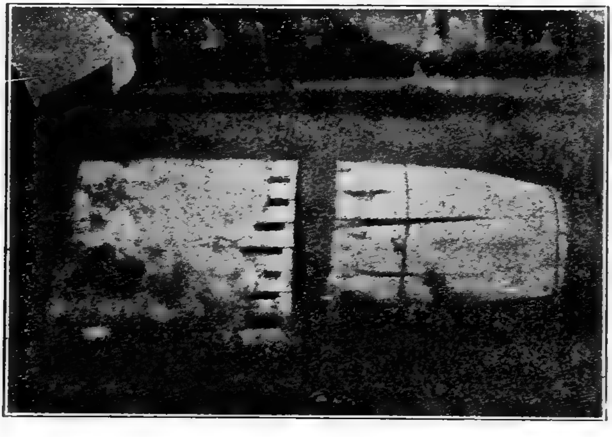


FIG. 93

**At Hatching Time.**—What to do at hatching time depends a good deal on the hen. If she is a good sitter, she will stick close to the nest and will give no trouble. Occasionally a hen is found that wants to leave the nest with the first chick that hatches; in a case of this kind the chicks will have to be taken away from the hen and put in a warm place as fast as they hatch. Again some hens get nervous and excited when the chicks begin to hatch; they shift about in the nest, often killing newly hatched chicks by stepping on and smashing. Chicks must be taken away from these hens. The best of hens should be visited occasionally and the empty egg-shells taken out from under them; otherwise they are liable to slip over some of the unhatched eggs, smothering the chicks which they contain.

As soon as all of the chicks have hatched and are thoroughly dry, hen and chicks can be moved to the brood-coop; a good time to do this is late in the afternoon while it is still light enough for the hen to see to eat and drink; by that time she will have been fasting for two days and will be very hungry and thirsty. Give her a good drink of water and a feed of whole corn and wheat. The chicks will be ready for their first feed the following morning.

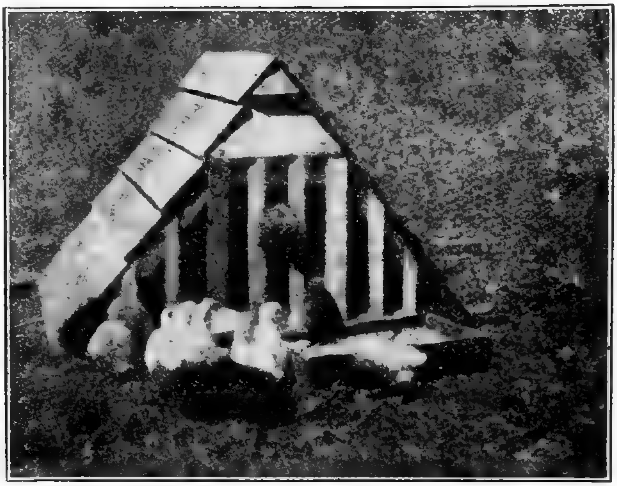


FIG. 94

The same rules and rations may be used for the hatched chicks as for those hatched artificially.

Fig. 93 is the old type of brood-coop and is even now used in haphazard poultry raising.

Fig. 94 is an improvement over the previous type of coop for rearing chicks, but it has many drawbacks. In the first place, a coop should be easily moved, and this is an unhandy kind; it is difficult to get into the coop for cleaning or other purposes.

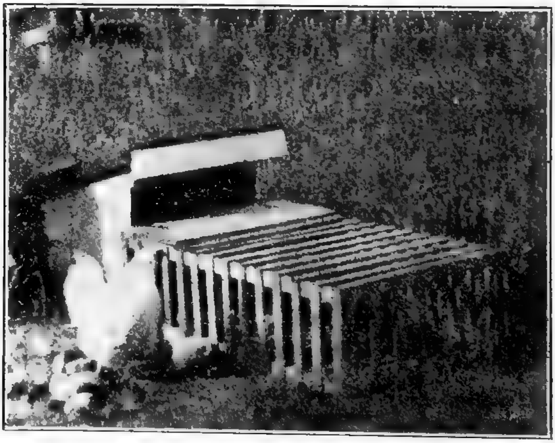


FIG. 95

Fig. 95. This cut represents the ideal way of handling the hen hatched chicks. The hen can be moved here to incubate her eggs, and you have her under control, and no trouble of the hen going to the wrong nest. After

the chicks are hatched, they have range near by the mother hen, but she is not permitted to carry them away so far. In case of rain, there is often considerable trouble in getting her to cover. With these coops there is little difficulty, if the showers come up, to get the hens and chicks under cover Some hens often give the chicks more exercise than they need at first, and somtimes carry them into many dangers. These coops are about 2½ feet square. Keep them off the ground about 2 inches, so the floor will remain dry. Use 1-inch mesh poultry netting or screen wire in front above the door for ventilation.

Figure 100 is a coop for a hen and chicks such as are used by E. B. Thompson. You will note that the hen is kept confined to the coop and the chickens permitted to run at large when the weather permits. The feature of this coop is the fact that it has three doors which make ample provision for every need and condition that may arise. First, there is the slatted door so the chicks may run back and forth at will when the other two doors are raised. Then there is the next door which is covered with one-inch wire. The hens and chicks can be confined to the coop with this door but they still get an abundance of air. It also protects against rats in summer.

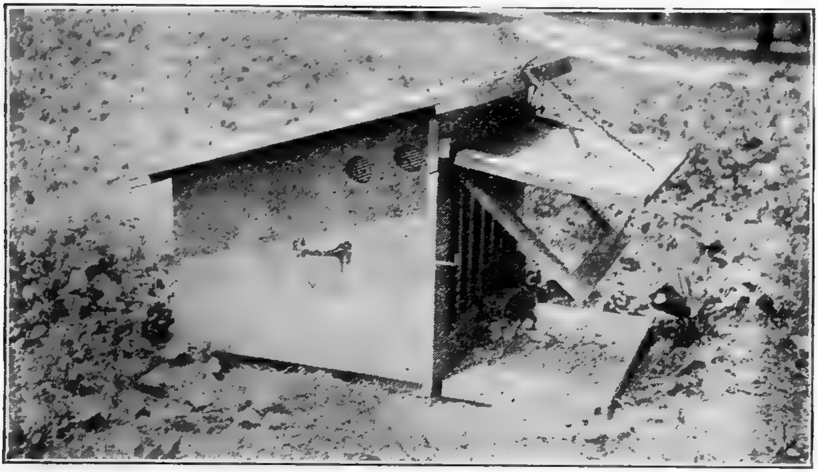


FIG. 100

FIG. 96

The third and top or outside door is solid. This keeps the rain and sun from beating into the coop, and permits you to close the coop tight if you wish. There are also holes on each side of the coop for ventilation. It has a board floor and the roof is hinged. There are handles on each side so it may be moved conveniently. The feeding board in front is also hinged to the coop. Everything that belongs to this coop is either hinged, nailed, screwed or chained to the coop so that it cannot be lost from season to season or get misplaced. The chains and fastenings for the doors are so arranged that they can be fastened at any height. This is an ideal coop for hen and chicks.

Fig. 96. This illustrates a large number of brood-coops on grass and near the shade of the orchard. A great many chicks can be handled in a year by providing this convenience. These runs can also be made with poultry wire by making frames and covering over. We prefer the use of laths to wire in making these runways.

Fig. 97. This cut shows the wire run in front of the coop, and gives ample range for the hen to take exercise. These can be moved to fresh ground in order that the hen can get green stuff and prevent the ground from being contaminated.

It is very necessary oftentimes to keep the chicks off the ground until the dew is dried off; especially is this true in managing gape-worms. These coops furnish a good way to keep them under such control.

Fig. 98 illustrates a method of hatching and brooding with hens that requires very little care on the part of the attendant. The Oregon Experiment Station has this to say about this method:

"One coop serves both for hatching and raising the chicks. It serves the triple purpose of an incubator, a brooder, and a small colony house. A convenient size of coop is 5 feet long and 3 feet wide, with a shed-roof 3 feet high in front and 2 feet high in the rear. It is large enough to divide into separate apartments for four setting hens. Movable partitions of canvas or burlap are fastened to a 4-inch or 6-inch board at the bottom and to a cross-piece at the top. It has an outside run 3 feet long for each hen, covered with a wire netting, as shown in the illustration. The runs are hooked on to the house and are dispensed with when the chicks are old enough to be given the liberty of the fields. These runs give the hens opportunity for dusting and exercise. By keeping feed and water before them all the time the sitters may be allowed to leave the nest and return at will.

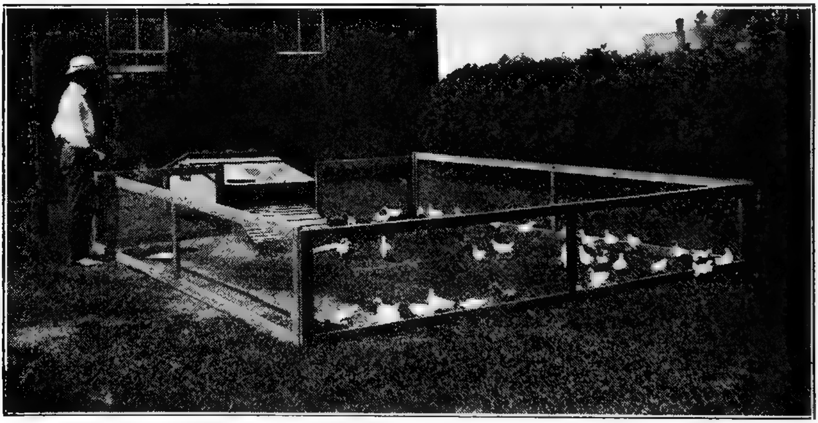


FIG. 97

In this way very little labor is required in caring for sitting hens. The door on the front is hinged at the top. Underneath this there is a frame of wire netting of 1-inch mesh, and in mild weather the door may be kept open. This makes it an open-front house, and during the summer months, when the growing chicks use it as a roosting-house, it will be found that this provision for fresh air is a necessary one. To more conveniently get at the nests of the sitters, there is an opening at the back of the coop. The top board, which is 10 or 12 inches wide, is hinged at the bottom and cut in the center, one door serving for two nests. In dry locations, and where the house can be moved to fresh ground occasionally, floors are not necessary or desirable. In some localities where rats are a pest a floor will serve to prevent losses of eggs and chicks."

## BROODING WITH CAPONS

Whether or not brooding with capons should be termed "natural brooding" is a debatable question; but for present purposes we will classify it under that head.

The raising of chicks with capons is something of an innovation. It is not generally practiced, largely for the reason that caponizing itself is not yet generally practiced. Most of those who have tried using capons as foster-mothers are enthusiastic over the practice. But we do not recommend it as a rule.

In one of his lectures, George Benoy, the famous "Capon King," discusses the use of capons as foster-mothers as follows:

"It certainly is an interesting sight to see a capon performing the mother's duties. When it comes to taking real good, attentive, loving care of a brood of newly hatched chicks, the capon has the old hen beaten at every turn. In the first place his plumage is much more abundant, the feathers are longer and softer, and his spread of wing is much greater than that of Madame Hen—in fact, his accommodations are much more ample in every respect. The capon has a commanding 'Cluck, cluck' that very little chicks seem to understand perfectly. And when the occasion demands, he has the capacity to raise his voice so that the youngsters that have strayed some distance away may hear him and regain the brood in time to avoid danger. Best of all, the hawk does not fly that can take a chick from a good capon. On various occasions I have seen a capon with a brood of chicks take a running shot at a hawk—the big yellow kind—that was in the act of seizing a chick and knock the hawk as much as ten feet rolling on the ground. As the hawk regained his wings he lost no time in getting away, and no further trouble was experienced from that particular bird.

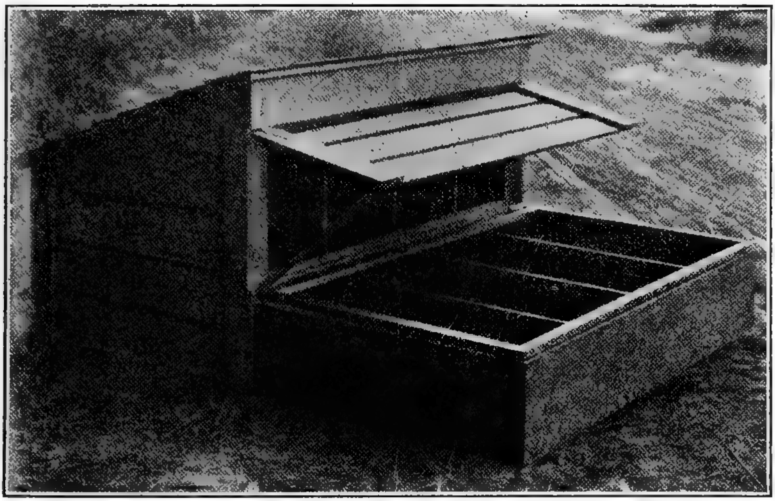


FIG. 98

"Of course, it is understood that a capon does not sit on and hatch the eggs. But he will and does cluck and hover a motherless brood of chicks willingly and much better than the best of hens. All hens are not alike; some are much better than others with chicks; capons are the same in that respect—some are better than others.

"Where it is advisable to change the father capon from a bunch of larger to smaller chicks, it is, of course, necessary to wean him from the larger ones. To accomplish this, it is best to shut the capon up in rather a dark place for three or four days, entirely away from the old brood. The younger chicks may then be placed under him some night and left the following day with him, after which he will usually take up with them, and no further trouble will be experienced.

"It is no trouble to start a capon with little chicks in the first place; they just naturally take to young chicks, the same as a duck takes to water. It is important, however, that the capon be quite gentle, or he will be more difficult to handle. For best results have a small yard with a coop in it; place the capon in this yard a few days before you intend to give him the chicks; it will give him time to get located and at home in his new quarters.

"If the capon has never raised chicks before, it is best that the chicks be about one week old to start him with. As the brood-coop has no porches in it, the capon will go to roost squatting on the floor. Just about dark take the little chicks out and place them under his wings, one or two at a time, until they are all under. The capon will not object to this, but will rather like it. Should he, for any reason seem to be restless, tickle him a little under the chin and talk to him a little in a soothing voice, and all will soon be well.

"You will have to be up good and early the next morning to see how things progress. Usually, the next morning the capon will be talking, scolding, and hovering the little fellows, the same as the hen. Sometimes one will seem to be in doubt—will hold up one foot in his feathers, standing on one leg, and not saying much. Where they perform in this manner, take the chicks entirely away and try it again the second night, in the meantime keeping the capon confined to the coop and as dark as possible. By the second morning the most obstinate of them will be clucking and ready to fight for the brood."

## STARTING THE CHICKS

**Transferring to the Brooder.**—About forty-eight hours after the chicks begin to hatch they should be ready for transferring to the brooder, and the brooder should be warmed up, regulated, and ready to receive them. The best time to transfer the chicks is in the morning, so that you will have that day to watch them, see that they get used to heir new quarers, and that all conditions are favorable. In transferring, do not give the chicks any possible chance to become chilled. Do the work quickly. Place them in warm cloth-lined baskets and put cotton flannel or some other warm cloth over them while carrying them to the brooder.

**In Their New Home.**—If there has ever been any trouble with white diarrhea, the chicks should be allowed to drink a little sour milk or buttermilk just as soon as they are put in the brooder—just a few swallows, not all they can drink. The chick will usually start drinking right away, if you stick its beak in the milk, so as to give it a taste. It has been found that sour milk or buttermilk contains lactic acid and that lactic acid seems to be sure death to **Bacillus pullorum**, the germ which causes white diarrhea, or at least prevents its growth. This simple home remedy has proven more efficient in combating this scourge than most of the expensive advertised remedies. It also seems to sharpen the appetite and promote the growth of the chicks. If you do not have sour milk or buttermilk at hand, or do not consider it necessary to use it, give the chicks a drink of **lukewarm** (not cold) water when you place them in the brooder; after this they should be placed under a hover and allowed to sleep and rest for a couple of hours before they are given their first feed.

If the chicks have been placed under a circular hover, a muslin frame or pen of some sort should be placed around it, so that they cannot get more than a foot away from the hover during the first two or three days. It is highly important during these first days that the chicks be given no opportunity to get chilled, and that they learn where to go when they want to get warm. If an ordinary brooder is used, they should not be allowed in the outside chamber until after they are three days old.

**Feeding the Chicks.**—"Little and often" is the best general motto that you can adopt with reference to feeding baby chicks during the first few days of their lives. The newly hatched chick is a very tender and frail little creature, and must be treated as a baby. As has already been stated, the lives of thousands of these little fellows have undoubtedly been sacrificed on account of ignorance as to the best kinds of feed and the best methods of feeding. Some of the more common mistakes in feeding which have been made are: Feeding too soon after hatching, feeding too freely, feeding sloppy food, feeding too much corn, feeding commercial grit at the start instead of coarse sand, etc.

**The First Feed**—Chicks should not be given their first meal until they are forty-eight to sixty hours old. The reason is this: Just before the chick is hatched it absorbs, or, to be more exact, takes into its body, whole, the yolk of the egg which produced it. This yolk has sometimes been spoken of as "Nature's lunch-basket." It is intended by Nature for the little chick to live on until it is strong enough to shift for itself. It usually takes from forty-eight to sixty hours to digest this yolk; and if the chick is given something else to eat before that time, digestive disorders are liable to arise.

**What to Feed**—Poultrymen are by no means a unit as to what should constitute the first few meals for baby chicks. Possibly it cannot be said that there is any one "best" feed. Yet, in a series of very careful experiments carried on at the Missouri Poultry Experiment Station, in which nearly all the methods in common use were given a thorough try-out, a mixture of rolled oats and bran was found to give best results. The ration was mixed in the proportion of two parts rolled oats to one part bran, to which was added a small amount of charcoal. A small amount of this mixture was fed on a clean board or paper three times a day. Care was taken not to feed them more than they could clean up in ten or fifteen minuets, and the boards were taken out as soon as they were through eating, so that they would not become soiled with the droppings. Occasionally, in order to get the chicks started to eating the first time, it is necessary to tap the feed board repeatedly with the fingers. The little fellows are great imitators, and when a few of them get started to eating, the rest will soon follow suit. The above is used for the morning, noon and night feed, the rolled oats and bran being fed three times a day, and a good grade of commercial chick-feed is scattered in the litter between meals. This will induce the little fellows to exercise, and it will not be long until they will leave the barn and oatmeal to dig after the seeds and grain in the litter. After they are two weeks old, substitute dry mash for the oats and bran, and feed the grain at morning, noon, and night ,and the dry mash between meals.

**Grit**—Most of the grades of little chick grit which are on the market are too sharp for newly hatched chicks; for this reason good, clean, coarse sand is preferable for the first few days; a little of this sand is sprinkled on the feed-boards about the time the first feed is given; no grit of any kind is given prior to this time. Grit should be used sparingly and with care until after they are ten days old.

**Water**—A never failing supply of pure water is vital to the welfare of young chicks. For the first few days the water should be given lukewarm, never cold. The water should be changed and the drinking vessel rinsed out three times a day, so as to avoid danger of disease as much as possible. The drinking vessel should be thoroughly scalded once a day. It should be so arranged that the chicks cannot get into it and cannot spill it into the litter in which they are scratching.

## FEEDING GROWING STOCK

When the chicks have reached the age of six weeks we then place a dry mash before them, composed of 2 parts bran, 1 part shorts and 1 part corn meal. This is placed in a hopper. It is also a good idea to mix a little fine charcoal in this ground feed, also half a pound of fine salt to every 100 pounds of the mixture. This mash is used until they are fully matured. From the time the chicks are six weeks old until maturity you can feed them equal parts cracked corn and wheat, fed in hoppers. If you cannot furnish your chicks with the sour milk or buttermilk, it may be necessary for you to add one-half part of high grade beef scraps to the dry mash if your chicks haven't free range and do not get a liberal supply of bugs and worms.

## HOPPER FEEDING

Hopper feeding has many advantages, both in care of growing stock as well as with the older fowls. Where it is intended to use the hopper method in the laying houses there is a big advantage to be gained in growing the chicks, by this method. We should, however, provide the proper style of hopper. It should be so constructed as to give protection in wet weather, permit the grains or mash to feed freely and be so arranged that its contents cannot be wasted or scattered over the ground by the chicks.

The use of hoppers for feeding both grain and dry mash after the chicks are six weeks old is a good practice. By this time they are usually placed out on free range in coops or colony houses provided for that purpose. If you continue to feed the chicks by hand when you open the houses each morning to let them out, they will wait and follow you and beg you to feed them. They fill up on the grain or the feed you give them. They then sit around and wait until the noon feed, and just so at night again. The result is that they follow around after you every time you come in sight, and they are never satisfied or contented and do not hustle and get the exercise or develop as they should. But if you place all the feed in hoppers when you turn them out of the coops each morning they pay no more attention to you than if you were not there. They rush by you and on by the hoppers containing the feed and out into the clover and cornfield or orchard in search of worms, bugs, etc. They soon learn that the food is always there when they want it, and they also learn that the "early bird catches the worm" and they go in search of them first. Then they come back to the hopper and fill up on grain and dry mash. But if you hand-feed, unless you are an expert, the chicks fill up on your feed and then sit around in the shade of a tree until they see you coming in sight again. The chicks know much more about their wants than does the average inexperienced person who attempts to raise poultry. For this reason we think your results will be far more satisfactory if you feed the ration recommended above for growing stock, and feed it in a hopper and allow the chicks to help themselves after they are six weeks old. By actual test they do not eat any more where they are hopper-fed than where they are hand-fed. A good out door hopper is illustrated by Fig. No. 99.

**Green Food**—Chicks do not need green food the first week—in fact, green feed given during the first few days is liable to cause bowel trouble; after the first week, however, green feed of some sort is indispensible to best results; without it the chicks do not make as good growth or put on weight as rapidly.

After spring is well advanced and the weather is mild and green grass is plentiful, there is no green food problem—Nature supplies it; but in winter and early spring green feed of some sort must be supplied.

A few pieces of thick sod thrown in where the chicks are each day both supplies green food and furnishes a valuable source of exercise. Sprouted oats is another valuable green food for little chicks. A very good plan to sprout the oats and furnish them to the chicks is to sprout them in shallow portable trays; when the oats are well sprouted, the sprouts being about an inch and a half high, the tray containing them is placed in with the chicks; as soon as they learn what it is, there will be a rush for these succulent morsels. As soon as the green sprouts have been picked off, or the chicks have had enough, the tray is taken out, and the oats allowed to sprout for two or three days more before it is put back again. In this way a single tray of sprouting oats can be used several times. By having several trays, this tender green feed can be provided daily.

Great care should be used in starting the chicks in on green feed not to overdo the matter. They must be gotten used to it gradually. They relish it greatly, and if allowed to eat all they want at first, bowel trouble will sometimes result.

## KILL CRIPPLES AND WEAKLINGS

No matter how great care is taken in hatching chickens, and regardless of whether they are hatched with hens or in incubators, some of them will be crippled, undersized, or will show other unmistakable signs of constitutional weakness. These weak chicks should not be allowed to live. While this advice may seem entirely devoid of sentiment, yet it is prompted by the good old American doctrine of "the greatest good to the greatest number." Their presence jeopardizes the health of the rest of the chicks, for the weaklings are always the first to contract and spread disease.

As a matter of fact, to quickly do away with chicks which are hatched cripples, or which show other signs of weakness, is the most humane and sensible thing which can be done to them. The chances are that they will just linger along and die in a few days or weeks, at best. There is always a temptation to try to nurse along the cripples and weaklings; while they can sometimes be brought through to maturity, they will be of little value, and the time and labor expended in caring for them can be used to a far better advantage elsewhere. One of the big secrets of success with poultry is close and constant culling, and it should begin at the time the chicks are hatched.

## MATURING THE CHICKENS

After the chicks are feathered out, they are past what is commonly known as the "danger period"; yet, if best results are to be secured, they should not be required to "shift for themselves" entirely from this time until they are mature. To mature normally, they must be properly housed, properly fed, provided with proper range, guarded from natural enemies, and protected from the outbreaks of disease.

**Housing Growing Stock**—A common mistake, and one which often results in stunted and otherwise malformed birds, is that of housing the growing stock with the mature stock. The result is that they pile up in the corners of the hen-house, become infested with lice, are beaten about and imposed upon until it is impossible for them to develop normally.

The ideal way of housing growing stock is by means of the double-room brooder house such as is illustrated in this lesson, or in movable colony houses, such as the Fool-proof Colony House described in the lesson on poultry-house construction. In this way not more than fifty head are kept together; the houses can be dragged out into the orchard, along the corn-fields, etc., where ideal conditions obtain. These two systems of housing growing stock are the only ones which will give real satisfaction in the long run—especially where several hundred head of chicks are being raised each season.

**Range for Growing Stock**—An abundance of free range is absolutely essential to the proper maturing of young stock. Birds matured under intensive conditions do not feather out properly, are lacking in constitutional vigor, and are generally unsatisfactory. Of course, there are apparent exceptions to this rule, but they are "few and far between." Prize-winning birds have been hatched and reared in back-yards, but their raising entailed so much more time, labor, and expense than if they had been raised under normal conditions that it cannot be recommended as a satisfactory practice.

Ideal range for growing stock is well drained and provides both natural shade and an abundance of green feed. Corn-fields furnish almost ideal range conditions; insect life abounds, the growing corn furnishes a semi-shaded condition, and there is usually planty of green feed. Birds matured under such conditions usually come up in the fall, red-combed, husky and vigorous, ready to excel in show room or laying house.

**Feed for Growing Stock**—Growing stock should never be allowed to get very hungry. It is a case of being "penny wise and pound foolish" to try to compel the chicks to rustle for all of their living. To make a maximum growth and put on the largest amount of weight, the organs of digestion must be kept busy twenty-four hours a day. Use hopper as shown in Fig. 91, with grain on one side and dry mash on the other.

## FEEDING FROM START TO FINISH

The method of feeding, which is used quite extensively, is as follows:

### FIRST DAY

"Yolk in body supplies food. Do not feed.

### FIRST WEEK

"Boiled eggs cut fine, bread crumbs and oatmeal, equal parts. Feed in form of mash on clean board, all they will eat in 20 minutes, five times per day.

"Give sour milk each forenoon and water in afternoon.

"Keep fine grit or sand before them.

### ONE TO FIVE WEEKS

"Equal parts wheat bran, shorts, oatmeal and corn meal.

"Use as a mash in hopper and give good grade of commercial chick feed in litter.

"Two pounds fine charcoal and one-half pound fine salt should be added to each hundred pounds mash.

"Sour milk or water should be before birds at all times.

### FIVE WEEKS TO MATURITY

"One part ground oats, 1 part shorts, 1 part wheat bran, 1 part corn meal, ½ part beef scraps, ¼ part bone meal.

"Use this as mash in hopper, and give equal parts cracked corn and wheat in litter, all they will clean up in thirty minutes, twice each day. Fresh water and grit should be before them at all times. Free range should be provided."

Very complete details of feed, care and methods of handling day old chicks will be found in Lessons 14 and 15, "The Baby Chick."

## AS OTHERS SEE THE BROODING PROBLEM

The New Jersey Experiment Station makes certain valuable suggestions as to pracitices in brooding, which it might be well for us to quote at this time:

"In order to get the chicks in condition for removal to the range it is necessary after the second week to practice a hardening off process. This should be gradual and consist of lowering the temperature with the idea of doing away with artificial heat entirely in from three to six weeks, depending upon outside weather conditions. The best practice is to reduce the artificial heat until it can be entirely given up, then gradually to raise the hover until it can be removed and replaced with muslin covered frames, having them hung to the hover wall, gradually raising them in front a little each night until the chicks become used to their absence. It is impracticable to take them from a warm heated brooder house and put them into a colony house unless they have been accustomed gradually to the change. The idea should be to get them on the range as soon as possible. When they are four weeks of age, the sooner they can be gotten out into the cool temperature in large, well ventilated quarters with free range and abundance of green food and access to the ground the better they will grow, and the hardier and more vigorous will they be at maturity.

"This hardening off process is especially desirable with Leghorns, as their close feathering makes them susceptible to cold weather, and when not properly weaned they pile up on one another to keep warm. This usually results in the death of many and a loss of vitality to the others. The most of the losses in brooding young chicks are due to following causes:

"1. Crowding and subsequent death, caused directly by a too low brooder temperature.

"2. A derangement of the digestive systems resulting in diarrhoea, and usually caused by wet, sloppy, early feeds.

"3. A loss of vitality and stamina, due to overheating.

"4. The tendency which chicks, especially Leghorns, have of devouring one another. It is commonly called cannibalism, develops chiefly in large flocks, and is due to an insufficient amount of animal material in the ration. The remedy should be to remove all birds which have been attacked or any which show signs of blood. A dry mash composed of equal parts of meat scrap, dry ground bone, oyster shell and wheat bran, should be provided in an open dish. This will correct the ration, and with care the habit can be stopped.

"5. A contagious disease known as white diarrhoea. Where the chicks are carried off during their early growth in large numbers, it is often caused by an infection which may be inherited by the young chicks, the disease in its chronic form being found in the ovaries of their mother. The best way in such a case is to completely disinfect the brooding quarters and provide the chicks with an abundance of sour milk to drink. The germs of white diarroea are easily killed in a dilute acid. The only way to avoid future epidemics is to trap nest all hens and find out which are infected. They should be killed when detected.

## GROWING PERIOD

"After the chicks are weaned and placed on the range, the aim should be to induce a continuous growth throughout the summer. By avoiding any checks, or set-backs, due to improper feeding or care, they will mature more quickly and more uniformly. There are three factors which affect the growth of the chick after weaning — (a) inherited characteristics; (b) environment, and (c) food suppy.

"The undesirable inherited characteristics which are the most pronounced are loss of stamina, due to breeding the adult birds which lack this requisite, and also small size and slow growth, which are usually caused by breeding from pullets rather than from mature hens. The size of the chicken at maturity is in direct proportion to its size and weight at hatching time, and hence the pullets laying small eggs, which produce smaller chicks when used as breeders, cause deterioration. The rapidity of growth, the feathering, and the ability to forage are largely inherited characteristics, varying with the different breeds. They must be given due consideration in outlining the management which is to be followed.

"Environment plays an important part, as the best bred chick, possessing all other desirable characteristics, if not given ideal conditions in which to grow, will not be allowed to exercise or develop inherited traits. These conditions are as follows:

"1. One should not attempt to grow young stock on restricted range, for it will not make a satisfactory growth, due to limited supply of green food and lack of exercise. Free range conditions should be provided, and extensive rather than intensive methods should be followed.

"2. Shade should be provided in abundance. Trees are ideal for this purpose, orchards being especially desirable. If trees are not available, corn or sunflower seeds can be planted, and, in the absence of either of these, artificial shelters of burlap over wooden frames should be provided.

"3. An abundance of green succulent food material is very necessary. If free range conditions are provided, this will be found in abundance. Where it is necessary to grow a large number of chicks on a limited area, the plot of land should be divided into two parts, colony houses being placed approximately through the center of the field and a portable fence placed on one side of the house, and later moved to the other side. This will permit rotating the two areas and growing desirable crops to supply succulence. Peas and oats can be sown early in the spring, followed by rape and later by buckwheat. In the fall, wheat, rye, vetch and clover, any, or all, can be sown to provide a winter cover crop and furnish early greens.

"4. The type and size of the house in which the chicks are placed bears a close relation to their growth. Fresh air is the limiting factor. The chicks are only in the house or shelter during the night, and all they need is protection from wet weather and enemies. An ideal summer growing house is one about 6x8 feet on the ground with a shed roof, the front beitng 6 feet high and the back 4 feet. The door can be placed in the center of the front, with a long, narrow muslin opening on either side of the door. The lower half of each side wall should be made in the form of a panel, hinging at the top to allow it to be opened out and up. When these two sides are opened, a free circulation of air through the house keeps the birds cool and comfortable on warm nights."

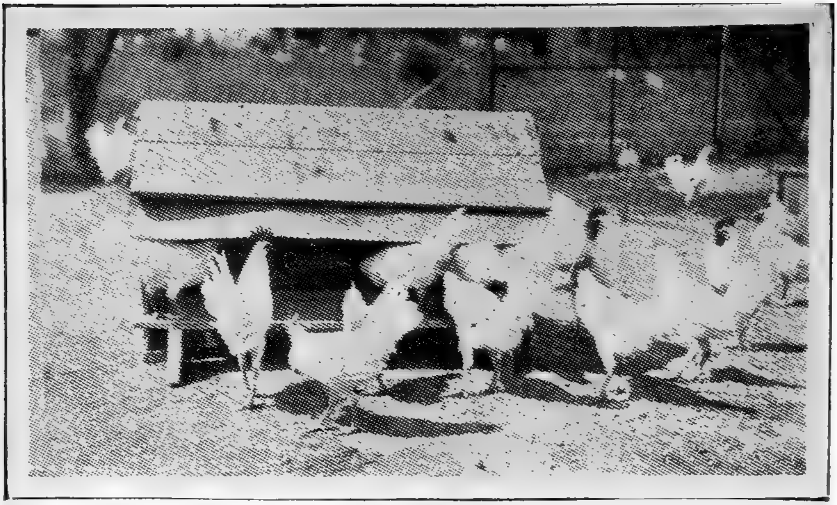


Fig. 99

## QUESTIONS ON BROODING

### Lesson No. 19

1. What do you mean by a portable or movable hover?

5. What are the disadvantages of the adaptable or adjustable hovers? number of them in one long building?

3. How would you arrange them if you desired to use them in an 8-by-12-foot Fool-proof Colony House?

4. What are the disadvantages of the portable or movable hovers?

5. What are the disadvantages of the adaptable or adjustable hovers?

6. Which is the greatest requisite to successful brooding, the hover and the heating device, or the box, brooder, or building containing same?

7. What benefits are derived from the use of runways in front of outdoor brooders?

8. What are the advantages and disadvantages of electrically heated hovers?

9. Mention some of the advantages of coal heated brooder stoves.

10. What size and kind of houses would you recommend that these be used in for best results?

11. What are some of the benefits derived from raising chicks in large units?

12. How would you partition your room in which you used a large stove if you wanted to brood chickens of different ages around the same stove?

13. With oil heated brooder stoves, what two things should be given special attention with reference to the oil regulator and the ventilation?

14. What two things often mean success or failure when mammoth hot water brooding systems are installed?

15. Should the heat in any brooder come from the floor or from above?

16. Mention briefly the advantages and disadvantages of the mammoth piped brooder house.

17. Mention briefly the advantages and disadvantages of the colony brooder house.

18. What features about the house should be given special attention in the construction of a house for either oil heated or coal heated brooder stoves?

19. What are the advantages and the disadvantages of the natural method of brooding chicks?

20. State briefly what you consider the best method of maturing growing stock.

# Intensive Poultry Culture

## LESSONS NOS. 20 AND 21

By T. E. Quisenberry

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The ambitions of the average farmer and townsman are in direct contrast. The average farmer who tills the soil wishes to secure enough surplus to move to town and enjoy the advantages of city or town that have been denied him and his family. The problem has become so serious that the newspapers and magazines throughout the country have given much attention to this fact and a public sentiment has been created that more people must remain on the farms. The fact, too, that there is a growing sentiment for rural improvement is making country life more attractive. Recently, the cityward tide has not been so great as a few years ago, when the farm products of every kind were so low in price. A few folks then needed to leave and become consumers in order to give those who did stay an opportunity to get more for their products.

On the other hand, a large percentage of salaried people in the cities are saving a part of their monthly pay check in order to purchase a small farm on which to spend the rest of their days. We are writing this with a view to helping this class of people especially. We have many who write us for advice along this line. They want to know the cost of land, the profits to expect from poultry products, and the best way to start a small farm. We contribute this matter with a sincere desire that we will mislead none, but be helpful to all of those who break away from the city and have their try-out in a small way.

We cannot advise you whether you must quit the work you are doing and invest your savings in a small poultry farm. We would have to know the land, your location, your aptitude and ability. There are a number of controlling factors on which success depends. We would have you remember that the way is not so easy as many would have you believe, yet we have faith in the branch of farming which we advocate.

Intensive farming on a little land is destined to bring many people back to natural life and to the soil. Children are all the better if they can live close to nature. Man has, to a large extent, drifted from the natural life to the artificial life of the cities, and mankind has suffered therefrom. A small flock of poultry, a little garden, and the things that go therewith, tend toward independence, freedom and health. After men work long and weary hours in unhealthy stores and shops, it brings new life if they can have an hour or two of recreation in dealing with nature itself. If for no other reason than we have just mentioned, it will pay the average city man to have a small flock of poultry.

There is no reason for failure with a back yard flock where the proper methods are followed. Any reasonably industrious person ought to be able to succeed. We do not deny the fact that a good many persons have undertaken back yard flocks and failed miserably. It is also true that the same persons, and many others like them, have failed with home gardens, and with every other enterprise that they have undertaken on their city lots or small farms. Many things are responsible for these failures. Some people are not disposed to meet the simple requirements for success; some are unwilling to learn from advice and experience of others; and sometimes mere neglect or plain laziness is responsible for failure in poultry keeping on a small scale. The unfortunate experience of this class of people should not cause any hesitation on the part of those who are willing to consider the practical possibilities of back yard flocks.

## THE CHOICE OF A FARM

The choice of the farm is one of the big factors that make for success and one on which will largely depend success or failure. The man and the land are the very foundation stones of successful poultry culture.

You cannot always tell about the value of the farm because one near by has produced large profits. On some farms in Florida big profits are made on celery, while a few hundred yards away is other land unfit for the purpose. Likewise, some spots will grow oranges at a big profit, while land in close proximity is entirely unfit for the production of same.

One farm can be highly productive and make big profits and yet the adjoining farm be practically worn out. The man who has handled the soil is one of the factors that make toward high production. One man hauls away the earning value of his land, while others feed the crops on the farm and more than maintain productiveness.

We do not believe that just any old land will do for poultry. Every foot of an intensive poultry farm should be made to earn something and more than pay you the rental value. Investigations show that farmers are not making the profits that they should from their farms because they are not properly distributing their labor throughout the year. If you have land that cannot be utilized for crops, you will never be able to employ all of your time and that of the horse you keep or the man you hire.

Many advocate making the poultry farm an exclusive business and let the other man grow the feed, but we do not agree with this policy in the majority of cases, as the droppings from the poultry can be converted into fertilizer and a large part of the value of the feed is obtained from the use of this on land in growing crops. Especially do we think every poultryman should grow his own green food and as much of his grain as experience proves to be profitable.

We do not mean to say that every foot of the land must be capable of growing feed, for it is possible to have some rolling land that is not suitable for this purpose that will grow fruit trees. You might just as well have shade that will produce profit, and if you have forest trees, it will pay you, in many cases, to gradually replace them with fruit trees. However, as a rule, it is bad to select a place entirely barren of trees. You are going to need a shade right from the start with the growing stock.

## THE WATER SUPPLY

One of the main essentials is to have plenty of water for poultry. In many cases you will find land with a spring which can be damned and reduce the expense of getting water into a tank. Often-times, an engine will be required to pump it, but you will certainly need water piped to the building to save the time of carrying water to the poultry houses.

Fowls, both old and young, require a great amount of water and it is essential that you note this point when you are locating a place.

Another important factor in the cultivation of the soil is that you lessen the danger of disease. The growing of vegetables or crops help to prevent the land from being poisoned. The constant stirring of the soil and the carryings of only one hundred hens to the acre for breeding stock will certainly save you from failure on account of an overcrowded condition, which has caused the failure of so many poultrymen. You can keep 100 to 500 laying hens on an acre, depending upon your method of handling same, and upon the climate and soil.

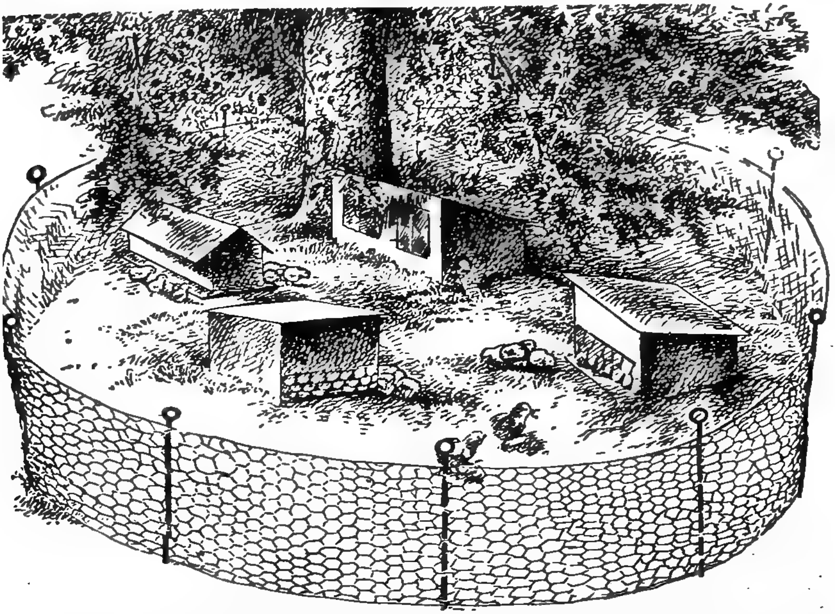
It is possible to swing too far in the advocacy of the intensive poultry farm. The over-stressing of the intensive idea and the creation of the opinion that it takes very little land on which to grow poultry are mistakes from which many are today suffering.

## THE 100 HEN UNIT

We admit that the growing of beef cattle, hogs, or dairy cows has been a safer business in the past than has the exclusive poultry business. In all live stock work, the important problem is the unit per acre. The land grows the feed and the cattle are used as the machines to convert the grain and roughage feed stuff into a highly finished product.

This type of farming, in which you consider the hundred hens as your unit, contemplates farm land that is tillable and where you are not in such easy access to markets. In the little Compton district of Rhode Island, in the Vineland district of New Jersey, or in California, a different problem confronts the poultry keeper. Here is a great specialized center, much of the land unsuited to the growing of crops, but you must consider that they are near the highest priced markets in the world. We are writing of a type of farming that can be duplicated in any section of the country where you are not near markets and where you can sell grain or green stuff that you raise at big prices through the hen hather than ship the grain. It is cheaper transported through live stock, and especially poultry and eggs, than it is to ship the grain.

This idea is not practical in many of the specialized districts, and in many cases you will make money by buying all of your feed, but we do not believe that you can make the same profits that can be made near the markets that pay the highest prices.



This is one of the best yarding arrangements for baby chicks that we have ever used. We use 1-inch poultry netting that is 2 feet in height. We have our blacksmith make a few small iron rods with a ring at the top and pointed on the other end which is forced into the ground. These rods are worked through the poultry netting and then forced into the ground which holds it in position and keeps it from sagging. A poultry fence that is no more than 2 feet in height can be stepped over by the attendant but the chicks are kept inside until you desire to remove the fence. When that is done, the wire is rolled up and the iron rods and all are rolled with it. This is stored away until needed again. It is not always convenient nor the best plan to build permanent, substantial yards to meet temporary spring needs. Where space is limited, especially grass space, it is much better to move the chick coops about and give the grass a chance to grow and the ground to freshen, for the chicks eat down the grass. For a movable fence there is nothing that we have seen, so convenient as the simple arrangement shown above. Instead of setting posts in the ground and fastening the wire with staples, as is usually done, the fencing is held in place and upright by wire posts or pins made of one-fourth inch material, sharpened at one end and looped at the other, thus making them each to push into the ground and pull up. By being woven through the mesh of the fencing, they act as posts and braces in a very satisfactory manner. This simple fence can be quickly moved or taken down, rolled up and stored away. The chick yards can be changed in a few minutes to include more grass or can be moved to a different spot. One or several brood coops can be enclosed and the chicks are thus kept under ideal conditions at all times, so far as yarding is concerned. The fencing does not have to be cut to fit any particular pen, but can be left in the roll and all or part of it used as desired. Brooders or brood coops can be placed under a tree and the fence run around the tree. This makes an ideal yard for chicks and they can get not only sunshine and shade, but the bugs and worms that are to be found in such places.

## TRANSPORTATION AND ITS RELATION TO POULTRY FARMING

The relation of transportation to poultry farming is close and should be carefully considered in the choice of a location. However, we do not believe that it is necessary to locate right near one of the large centers where the prices are highest.

Granting that you are ten miles from a big city, the chances are that you will be compelled to use the parcel post, a truck, or express. If the latter method is used and you sell to the commission man or to a high class retail dealer, you have express charges to pay. The land in this location will no doubt be higher than should you locate farther away. In some of the border Southern States, as Virginia, Maryland and West Virginia, it is possible to get land much cheaper than you could near a large eastern city, which would outweigh the advantage offered by nearness to the city for marketing purposes. Eggs are not such a perishable product as milk and you can handle express shipments much easier than you can shipments of most any other farm product.

## THE FEED QUESTION A BIG FACTOR

A dozen eggs in normal times will buy about 17 pounds of wheat in New York and about 14 in Iowa, but in corn the dozen eggs will buy about 24 pounds in Iowa, 22 pounds in New York, 25 pounds in Massachusetts, and 15 pounds in Alabama or Mississippi.

For specialty poultry farming we need to locate where transportation facilities can be had. They should be accessible to the great markets.

We do not agree with the many who say that just any old land will do for poultry. It is poor management not to grow some feed crops on the land and, if you expect to do this, you need a very productive soil. The fact that you are going to keep at least a hundred hens to the acre will help to keep the land in condition to grow good crops, but if you do not have a soil to begin with that is capable of being brought up rapidly you will not find much profit in your crops. One thousand hens will produce about 13.5 tons of manure per year. This is equivalent to a money value of about $168 per year. If this is placed on fairly good land and balanced with the fertilizers needed, it becomes a good asset and one that cannot be overlooked. A ton of poultry excrement contains about 296 pounds of nitrogen, 116 pounds of phosphoric acid, and 72 pounds of potash.

Many states issue soil maps that show the deficiencies of the soils in the various sections. It would be well to always write to the State Agricultural College of the state in which you are interested and find if such a map is issued. If the state has no such map, write to the Department of Agriculture at Washington and get a soil map of the U. S. By learning the deficiencies of the section in which you want land you will have a partial guide.

Land deficient in nitrogen can soon be restored, but if the land is badly deficient in phosphorus and lime, it is hard to bring it to such a condition as to produce bumper crops.

Sometimes it will pay you to buy a farm that has a dwelling and barns, but often-times it is a mistake to buy an abandoned farm, as in most cases there is some good reason for the farm being abandoned. A good test of fertility and producing power of any land is the character of people that live on the land and their degree of prosperity. We heard Mr. Joe Wing, the great alfalfa expert of the United States, once say that lime stone is the bed rock of civilization, and no one could fail to see the difference in the character of a people who lived in a country deficient in lime, and then roll into a lime stone region to see the fine homes, fine stock, and the prosperous appearance of the entire country.

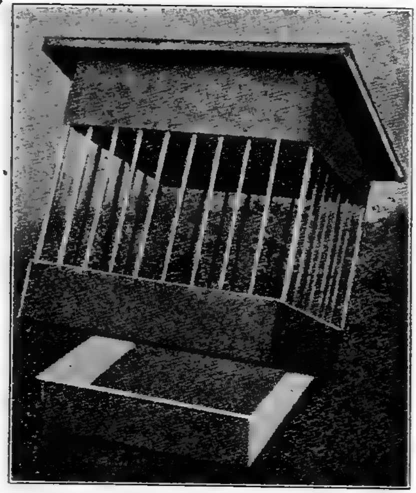
When people who live on farms are poverty stricken, it is not always the fault of the men, but in most cases you will find the real cause to be the soil, which fails to yield a sufficient increase to afford the comforts of life and permit the people to build good homes and educate their children.

Many a back-to-the-land enthusiast has invested his savings in a worn out farm which not even a man trained in the business could make pay. It is bad to start with this handicap. As an inexperienced man in farm work, you need the very best land that you can buy for the money to make the land pay interest and afford you a labor income above expenses.

From the questions that come to us, it seems that we need a location bureau and a bureau of markets to help our people in selling their stuff. We are doing our best to help along this line, and are trying to put many in touch with good markets.

In the grain belt of the West, land will cost from $75 to $200 per acre, and, though you have the advantage of cheaper grain, you are still about as far from the markets that pay the higher prices as you are in many sections where land is cheaper.

You are nearer to the best markets in the world in the eastern states and you can no doubt find many opportunities to buy land at reasonable prices. If you live in the East, the West, or any other section, consider well the advantage near at hand before you begin a search far from home for a location. There are many moves made by people who go among a strange people that are regretted. When you once get started and your houses are built it is an expensive piece of work to make another move.



This shows a plain square galvanized watering pan around which fits a protection made of wire and a cover for shade and protection made of light-weight lumber and roofing material. This always insures clean and cool water and prevents the fowls from getting into the drinking pan at any time. The wires are placed just wide enough apart so that the chickens can drink freely from same. The cover can be easily raised so that the pan can be thoroughly cleaned or easily refilled. This is a splendid device for watering fowls where growing stock or laying hens are kept out on range. The size of your pans depend upon the size of the flock for which they are intended. The frame of the cover should be about an inch larger on either side than the pan that is to be covered. A large, plain galvanized pan, such as shown here, is one of the most durable and satisfactory watering devices that can be used. Keep them in the shade and protect them as much as possible from the feet of the birds. We have used these large pans without a covering and with very good success.

A poultry plant in a section where there are only a few engaged in the business is not so easily sold as one located where other men are succeeding.

Opportunities for locating in the Middle West and shipping to the Eastern markets should not be lost sight of. In many sections land can be secured at reasonable prices and you are then near the great granary of the United States where grain is cheaper than in any other section.

It has been proven that you can, with modern transportation, run a poultry farm in this section and ship your eggs to the highest priced market. The express rate is double but the cheapness of grain makes up the difference.

There are many men living on town lots who could spend their early morning hours and the time after they come from the office with pleasure and profit to themselves. All of us need a hobby to carry us away from the problems of business and to give the mind a rest. Thousands of business men are dreaming of the day when they can retire from business and have some out-of-door occupation that will procure them a living and afford a change from city life

A great many enthusiasts give up their business in town, and, without knowledge of the growing crops, handling of live stock, or raising of chickens, make a try-out of farm life. Some succeed, but too many fail.

Before investing and giving up a good business or a good position consider the hardships of farm life. Most of you will be compelled to engage in some kind of very intensive farming. For general farming you will need, according to the office of Farm Management of the Federal Department, at least two hundred acres in order to make a unit where farm labor can be used the year round and where teams can be employed to the best advantage. We take it though that many of our students are not going to have the money to buy a two hundred acre farm and will be compelled to make a small beginning and buy only a few acres.

You can get practice on a city lot, in connection with the lessons that you are getting, and learn to apply the principles of poultry culture. This fact makes the poultry work rather inviting to those who seek to get away from the city and begin life on the farm. By buying a few acres near a city or a good town where the poultry can be marketed, the change is not so radical and you will be in closer touch with some of the advantages that city and town life afford.

The pages of poultry history are blurred with the stories of many defeats. To the inexperienced and unlearned in the art, the keeping of poultry has seemed to be the easiest route to fortune and a comfortable old age. These failures have tended to cause the average business man to see little hope for the future of any one who should give up his work in the city and start life anew to make a livelihood from poultry keeping.

We have passed through the critical stage and are now approaching the time when the keeping of poultry is becoming just as much a science as the keeping of beef cattle, running a dairy, or raising hogs for the market.

Some of the failures were due to causes that probably no expert could have overcome, because there were many things that we did not know. But science has made the work more exact and we have learned many things of vast importance, the knowledge of which will often turn failure into success.

You cannot expect to give up your position, buy you a twenty-acre farm, start without knowledge of the work, and hope to succeed. It is a work of detail and requires a technical training reinforced by some experience, just as much so as does the practice of medicine, or the practice of any of the learned professions.

We cannot tell you who will succeed or who will fail unless we know the individual well, and even then we could be badly mistaken in our judgment. Much depends upon the man behind the work. A man, with a love for the business, who is properly trained, and who has good judgment and an abundance of common sense can succeed.

We knew a doctor once who could repeat almost word for word the lectures he heard in college. He knew medicine, but the was a failure as a practitioner. Many men know the law and yet fail to make a living in the law profession. They know the books, but cannot handle a case.

We do feel that if you will have a well mapped out plan, a good location and know how to put what you have learned into practice that you should make a living in the work. Not many will make a fortune, but with each year their plants will grow and increase in value, so that if they merely get a living they will save more in the increase in the value of the plant, by the increase of the flock, the addition of buildings, etc., than could be made in town or city depending upon the monthly pay envelope.

You can look forward to old age with a degree of comfort which does not come to the man who depends on the monthly check.

We are in the poultry work because we feel called to the job and our aim and purpose is to help humanity. We do not want to mislead you or have you undertake something that would mean failure to you. We want you to succeed.

We do not see how you can expect success without some capital for equipment and the purchase of a farm, any more than a merchant can run a business entirely on borrowed capital and make a living. Do not get in too big a hurry, but be sure that you have saved enough to make a proper start. A small farm will not, in many cases, pay big interest on money borrowed for entire cost of land and equipment and make you a living in addition.

## VARIED INDUSTRIES COMBINED WITH POULTRY

There are several industries that go hand in hand with that of poultry raising. Intensive production on small acreage admits of several lines being worked simultaneously. A few rabbits for family meat, a pen of pigeons for squabs, a cow for milk and butter, hives of bees for honey, a pig to clean up the waste and convert it into bacon, vegetables from a garden, fruit from the trees, and berries from the vines, all have their place in intensive farming.

We have seen farms where thousands of dollars were cleared each year as the result of squab raising. A large production can be obtained on a very small area. If the pens are properly mated and housed, the duties are not burdensome. If you have a good market for squabs, it might pay to add a few pens of pigeons for this purpose.

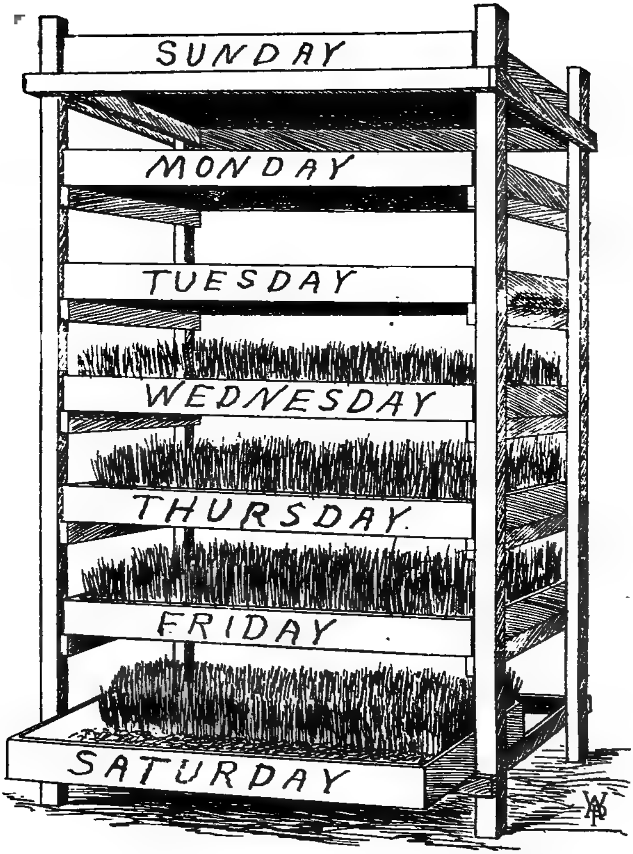
Cities are now becoming overcrowded and meat production is falling off and not keeping pace with the increase in population. This has a tendency to make the production of rabbits more profitable than in the past. For a good many years the rabbit has been one of the chief sources of meat in overcrowded European countries for some classes. They stand confinement well and grow rapidly into very choice meat. This industry is especially well adapted to small farms. Breeding of rabbits is an interesting proposition and, no doubt, will grow even more profitable than at present. They respond quickly to selection and produce very rapidly.

We do not recommend the raising of hogs in connection with poultry unless you have sufficient land and are properly equipped for handling both poultry and hogs. Many farmers, however, find that the two can be combined and it is possible for any poultry raiser to prepare a pen and keep at least one hog to consume the waste and thus produce a portion of his own meat and lard.

Many poultrymen who have from two to ten acres of ground keep one or more cows to produce the family milk and butter, and, in some cases, have a surplus for sale. There is nothing better for poultry than sour milk or butter-milk, and some poultrymen have found it profitable to keep a cow for this purpose alone.

There are certain kinds of fruits and berries which can be produced in connection with intensive poultry farming. It will at least pay every small farmer to have sufficient trees and vines to produce sufficient fruits for his own home consumption. The trees and vines furnish shade for the poultry. Delicious strawberries, blackberries, raspberries, gooseberries, apples, peaches, pears, cherries, and other fruits of different varieties can be produced in connection with poultry raising, if you have your place properly arranged.

Each little farm should keep a few stands of bees to produce honey for the table, and have the surplus for sale. Bees are easily cared for and they are a good side line to combine with poultry raising. Honey is one of the most wholesome sweets and adds much to a good living. It will pay a small poultry raiser to consider some of the suggested side lines to combine with intensive poultry culture.



Every intensive poultry farm should grow an abundance of green food. This is an illustration of a rack and trays that can be used for oat sprouting. The corner posts are made of 2x2 material. On the side of each slat, as you will note in the tray for "Tuesday" shown in the above figure, there is a batton nailed on each of the slats to act as a guide in pushing the trays into the sprouter. These prevent the trays from getting out of alignment and striking the posts when being put in place. The sprouting trays should be made of 1x3 material. The bottom of each of these trays is made of galvanized iron. The bottom of each tray is punctured full of holes with a 16 to 20 penny nail or some other tool that will make a hole about that size. You can not get them too thick for it is necessary that your trays drain well for best results. You will note that there is a tray for each day of the week. That makes the oldest of the oats being fed on the sixth or seventh day. The bottom tray should be about 18 inches from the floor and a piece of tin or galvanized iron tacked permanently to the frame of the sprouter in such a way that it is lower in the center than on either edge or either corner. Then you can simply take a sprinkling can and sprinkle the top tray of the oats once each day. Put sufficient water on top tray so that the water will drip or run down through into the tray beneath it and into the bucket or pan which should be placed on the floor below. The oats in each tray should be stirred up by hand once each day till they have well started to sprout. Each day they should be spread out level over the tray. This causes them to sprout even and helps prevent moulding. The trays should be built about 30 inches square or, if you have only a small number of hens, you can build a smaller sprouter or regulate the size of your sprouter according to your individual needs. It makes the trays inconvenient to handle if they are larger than 30 inches square. The slats should be so nailed that the trays, when in position, will be about 6 inches apart. If the sprouters can be used in an incubator room, cellar or some other room with a concrete floor, it is not necessary to be so particular about spilling water. We do not advise the use of lamps or artificial heat immediately below the oat trays, neither should the trays be enclosed. We never saw but few sprouters where lamps were used and where the sprouters are enclosed that the oats did not mold more or less. If you can purchase fine mesh hardware cloth, it is even better for the bottom of the trays than galvanized iron. If the mesh in the wire is too large, the oats may waste through same.

## COMBINING POULTRY AND GARDENING

The space devoted to garden spots can only be used during certain seasons of the year. During the remainder of the time it makes a splendid plot of ground upon which to keep poultry. The enormous amount of waste produce from the thousands of small gardens throughout the country more often go into the garbage can than into the profitable production of wholesome eggs and poultry. Vegetable tops, under-sized vegetables, and waste from the garden can be ground up and will go a long way toward maintaining a small flock of chickens. When the garden is not being cultivated the poultry can be allowed to range over same, and they will destroy many insects, and the soil will be fertilized and made better for the following year.

Most fowls get far too little vegetable matter. Lack of vegetable food is at the bottom of many cases of liver and other troubles. Fresh, juicy vegetables and insect life are the things to keep fowls healthy and prolific. It is possible, after all, to have a small plot of ground on which to keep a few fowls under the most healthful and profitable conditions. Kept under such conditions, fowls may be bred from with the expectation of getting reasonably strong, fertile eggs and livable chicks. When the weather is fine, and the land dry, the grain food can be lightly dug into the ground and the fowls will scratch for it until the last grain is unearthed. This will insure exercise and more satisfactory breeding conditions. Of course, you understand that it is necessary to keep your poultry out of the garden plot while the vegetables are growing and in some cases where they are ripening.

The combination of gardening along with poultry raising, gives the very best conditions for providing vegetables of the highest quality for the table, for poultry must have greens, and to grow a good garden requires manure. People who have large ranches, as a rule, set the poorest tables, for they are usually too busy with large crops or large herds, to grow a garden and raise poultry. Many of these people make long trips to town once a week to lay in groceries and canned goods. At the end of the year their crop is sold, their grocery bill paid and, too often, there is too little left. A smaller piece of ground, scientifically and properly maintained will often net a better living.

## OVERCOMING OBJECTIONS TO CITY POULTRY

It is not necessary or at all advisable to permit your flock to become a nuisance to your neighbors. The yard should be kept clean, and some shrubbery, fruit vines, or flowers should be kept growing around the fences surrounding the poultry yard, so as to almost hide the bare lot, if it is necessary to have such a lot, from the public view. Neatly built houses and a few shrubs and vines will make the place attractive.

Unless you are keeping some birds for breeding purposes, it is not necessary to have a male bird and disturb your neighbors. This will have no effect on the number of eggs laid by the hens. This will eliminate the noise from the neighborhood, and will save the feed bill.

See that your own birds are kept confined to your own premises, and are not allowed in any way to disturb the garden or flowers belonging to your neighbor. Keep the birds confined to their own quarters, which should be provided for them, and do not allow them to litter up your own walks and back door steps and prove a nuisance to your wife and family. You might just as well make a small back yard flock a pleasure and profitable to you, rather than to permit them to be the opposite, or to cause ill feeling in the neighborhood.

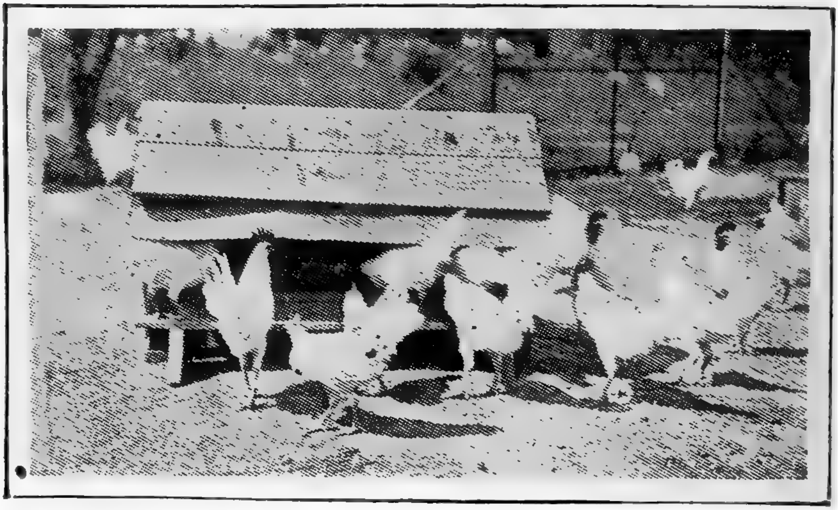
The poultry house that is kept on the back lot need not be expensive, but it should be made attractive, so as not to prove an eyesore to your property. The poultry house can be built in a neat and attractive manner at only a slight increase in cost over a ramshackle structure, and, when this is done, the owner is much more likely to retain his interest in his flock and, therefore, get more satisfactory results.

## THE MAN COUNTS MOST

Whether you make a success of intensive poultry culture depends entirely upon yourself. A large number of chickens can be kept on a small tract of ground successfully one year after another, if the soil, climate and man are all suited to the conditions. The poultryman must be able to discriminate between right and wrong, so as to suit his system of poultry keeping to his conditions. What might be all right in one location will not always prove the best thing in another, so the poultryman can often save himself from loss and disappointment by using his own head. If your soil is more or less sandy and dry, the sun and rain can do almost as good a job on it as a vacuum cleaner does on a carpet; and, in such a case, there is not much chance of the soil becoming contaminated with disease germs. Continuous cultivation will help to do the same thing. So, after all, the man himself is the bigest factor in winning success.

## MILLIONS INTO GARBAGE CANS

A great deal of inexpensive poultry feed, such as table scraps and waste produce from the garden will go a long way toward reducing the cost of keeping a small flock of fowls. This food can all be properly utilized. It is almost criminal neglect on our part as Ameircan people to see the enormous sum of $700,000,000.00 worth of waste produce from our kitchens dumped into American garbage cans. The greater part of this is poultry feed of the best kind. This would represent a tremendous saving if properly utilized. But even where all the feed has to be bought, poultry can be kept at a profit, and the cost of producing eggs in the back yard flock can be brought down to a remarkably low figure.



This pictures a bunch of cockerels that are using one of our hoppers. You will note that the rubberoid roofing extends down over each side and is tacked on the underneath side of the lid to prevent rain from beating in. You will also note the runway on the side of the hopper and the chicks standing on same. The partitions in the hopper run the long way. These hoppers can be built in any lengths from three feet up. Do not build them so long, however, that they are difficult to handle.

## TWO HUNDRED HENS TO AN ACRE

In making our estimates of the probable investment required for the equipment of an intensive poultry farm, we are allowing one acre for each two hundred hens. By many, this would be called extensive farming rather than intensive farming. The past history of the poultry successes and failures lead us to the conclusion that there is a limit to the carrying power of an acre, easily reached. This is the recommendation for breeding stock or for growing stock where they are kept on the same piece of land year after year. As for laying hens, especially in a climate like California where the land is more or less sandy, a very large number of laying hens can be kept on one acre. We have seen as many as 500 to 2,000 on many acre tracts in California. The Yesterlaid Farm in Missouri kept 5,000 layers on from 7 to 10 acres of ground. Many other farms keep their layers intensified. This is necessary to get the greatest capacity for the least amount of labor in handling. But more than 200 breeders should never be crowded on an acre if the land is to be used year after year, unless the land is sandy. This gives more green stuff, more free range, better health and greater fertility, fewer deaths in the shell, and more vigor in the young stock. If you double yard your breeders, allowing them to use one yard while you are cultivating and growing some green food in the others, this will allow you to increase the number of hens per acre. If the same system is used with the young growing stock, you can double and treble the number of young stock per acre.

The dairyman, or the keeper of beef cattle, considers an acre that will carry a cow and her calf very good land, in fact, above the average. We think that the hundred hens to the acre is a conservative estimate and if the land is cultivated, the acre in grain should pay for a portion of the feed bill. A farm so arranged that this can be done will show a much greater earning power and you will run little risk of soil pollution. Many have failed because of too intensive methods.

Even to start a five acre farm, we believe that you should have at least $1500 capital, and $2500 would be even better. In most cases, it is better to have the land paid for and a small home built before you give up the pay check and begin your regular business. In much of the boll weevil section of the South, land can be bought as low as ten dollars per acre. As you go further north, land is higher. In the far South, you have the disadvantage of the distance from the eastern markets. Tennessee, Virginia, and Kentucky, of the southern states, have excellent climates for poultry, good soil conditions, and good railroad facilities for reaching the eastern markets. The industry in these states is developing rapidly. You can buy land at moderate prices. Near many good railroads land can be bought for from $20 to $50 per acre; grain prices are cheaper than in many of the eastern states and you have the difference in cost of shipment to consider. No matter where you locate, consider all these points carefully.

In the far southern states, there is opportunity for shipment to the winter resorts of Florida, and to New Orleans, as the distance to the eastern markets is such that as the summer season draws near it is hard to dispose of your eggs on the eastern markets.

## CITY LOT POULTRY CULTURE

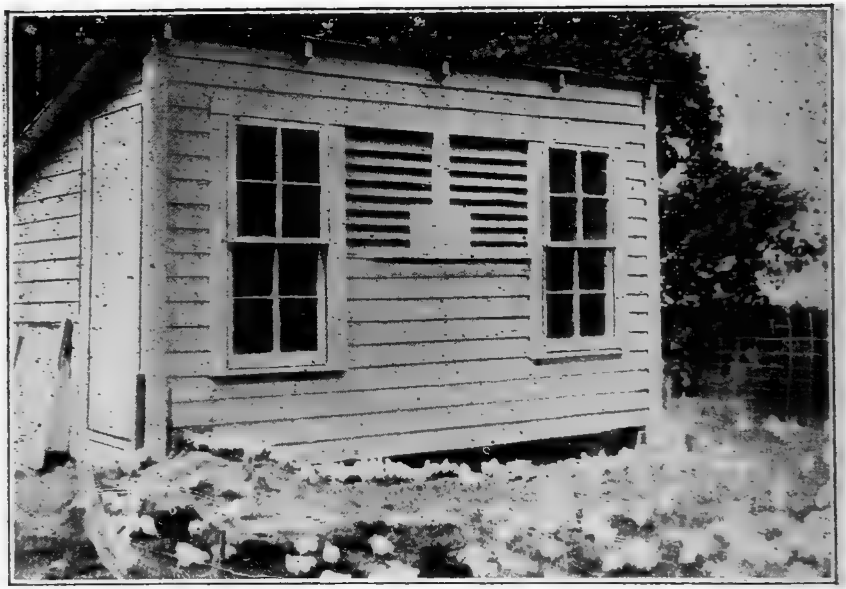
We need an immediate increase in the protein part of the feed stuffs of this country. Secretary Houston has recently sent out an appeal to the people of the United States to join in this movement. He points to the fact that there is no better way in which to supply this deficit than in this increase of the production of poultry and eggs. It takes time for the growing of beef, but results come very quickly in the poultry business.

The city dweller with a few feet in his back lot, or the suburban dweller with a larger space, or the man in a small town with a still bigger lot, can help in this nation-wide movement. Why haul off the left over table scraps to the garbage heap when they can be converted into eggs and meat. The waste material of the American table in the aggregate is tremendous. We cannot afford to waste one scrap when that scrap would form a part ration for a hen that could use it to make eggs.

The city man who has a taste for the handling of poultry can get a lot of pleasure and some profit in using the table scraps to keep a dozen hens going. It is true that some feed must be bought but this will be principally the grain ration as the scraps from the average table will about carry the hens, as far as the mash is concerned. These scraps have meat protein in the bits of meat that are left and you will possibly not have to purchase any meat scrap.

For this kind of work you will possibly want to use one of the American varieties or one of the Orpingtons. The Leghorns are highly nervous and will not be so well adapted to the back yard unless you keep one wing clipped, and have a five foot fence surrounding the poultry lot. The Leghorns stand confinement well and are not so much inclined to become overly fat like the larger varieties do when confined to small quarters. They will prove to be among the most economical producers of eggs. If you have tried out the larger varieties and have not done well with them, we advise you to try the Leghorns or Anconas. Both of these do well in confinement. You will, at the close of the season, want to convert the old hens into meat for the table. They will have increased in weight and you can about get your money back on the original investment.

We are taking it for granted that you are feeding this flock for eggs only and that you will not desire to breed your own stock, but will buy it



A small house like this can be built in any size from eight to ten feet up to twelve, fourteen or sixteen feet square. There is nothing better than a house of this kind for city lots. If a small house of this type is built, it can be loaded on to a truck and moved from one location to another without a great deal of difficulty. This shows a house with a temporary wire fence surrounding it, and four hundred baby chicks being brooded in the house.

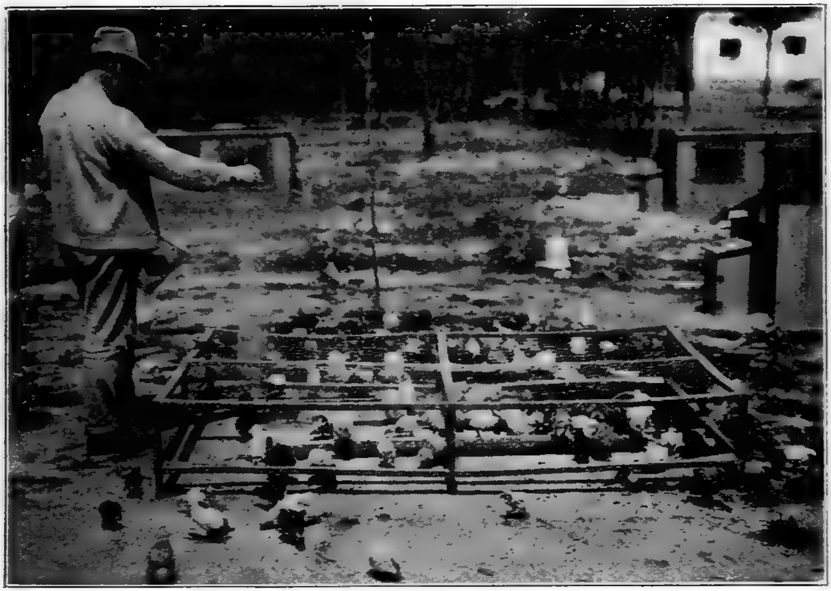
each year. Your small lot will not permit you to rear chicks and you will find that you would have poor success raising them in very restricted quarters. You can sell the hens at the close of each season and buy pullets cheaper than you can raise them, as a rule.

If you find some near by breeder and make known to him just what you want and ask that instead of marketing his fowls for meat he sell them to you for egg production, you should be able to get them at about two dollars each. This will give the breeder more than the market price and if you have one of the heavier breeds, you will have a fowl at the close of the season that will weigh 6 or 7 pounds, which valued at 20 cents will give returns on your original investment. You certainly could not lose much. Now it is possible, if you have a lot big enough to accommodate a brooder coop or two, to set two or three hens and rear enough broilers to run your table.

You can, by thoroughly disinfecting your soil, raise a few table fowls and have the luxury of a broiler, which not many of us can afford, at the prevailing high prices, in the early season. In doing this, if you have forced your fowl for eggs, which you should do, you may have to purchase some eggs from farm reared stock that will give you vigorous stock. Then, too, you may not want to keep a male bird which might be troublesome to your neighbors.

We do not think it is a very good plan to buy from the poultry dealers the class of stuff that they have. I would prefer to look over the poultry journal advertisements or the ads of some of the farm papers, if you cannot find what you want near the city in which you live.

In making your selection, be sure that you get early hatched pullets. March and April hatched stuff will be ready to go to laying in the early season. Be sure that they are well developed and are not stunted and if you buy from a breeder who is raising high class stuff you are not so apt to get fowls that are stunted, for he thinks enough of them to push them for growth.



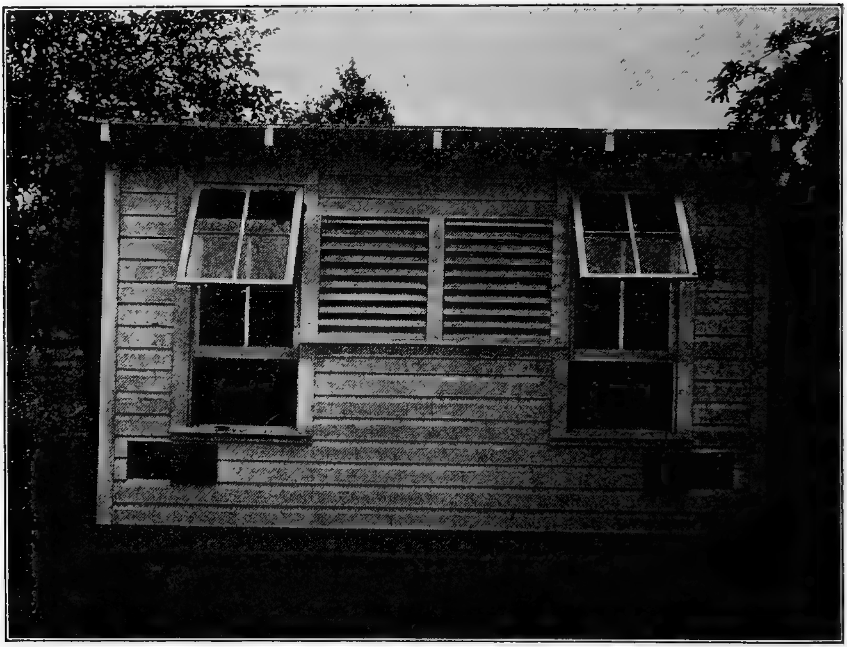
This is a frame covered with wire netting to protect young chicks from the older fowls while being fed. This is simply a square pen built about 18 inches in height, and the end, sides and top covered with poultry netting. This can be built out of light framing material or most any scraps of lumber about your premises. It is vital that the younger chicks be protected from the older ones, if chicks of different ages are being raised in one flock. The sill is about four inches from the ground which permits the younger chicks to pass in and out, but prevents the older fowls from entering the feeding pen. These are made as light as possible, so that they can be handled by one or two men and moved, to a clean feeding spot occasionally. Devices of this sort will save enough chicks in one season to pay the cost of same several times over. If the top was partially covered with roofing material so as to protect the chicks from sun and rain it would make the coop still more valuable. These coops are necessary only where young chicks are being fed and grown where there are older fowls.

## RATIONS FOR A CITY FLOCK

It is well to buy bran, shorts, and corn meal to mix with the mash scraps from the table. You can moisten the table scraps with water for you can hardly afford milk in the city for this purpose. Have your floor covered with litter and keep the hens working for grain. They are in restricted quarters and this is the only exercise that they will get. You can give them their mash at the dinner hour. It is well not to feed it early in the morning before you go to your business. Follow the feeding directions in our feeding lesson.

You will have much green stuff from the table and may not have to grow your green food. If you do not have sufficient green food, you can sprout oats. We have seen business men grow oats in their office, satisfy their longings to grow something green, and furnish pleasure to visitors who manifest surprise at the oats making such growth without being in the soil. Shade the yards, work in some air slacked lime and sweeten the soil by growing some green food by alternating the yards.

You must keep oyster shell and grit before them all of the time, and you can make a dust bath in some sheltered place outside of the house. We do not like the dust bath in a small house. You can soon have the litter full of dust, it gets into the water and makes the interior unsightly. It will affect the health of the fowls. You can use the preventives for lice and mites that we have given you in your lesson, and be sure to keep down these insects, for the close confinement in a small place will be favorable to their growth.



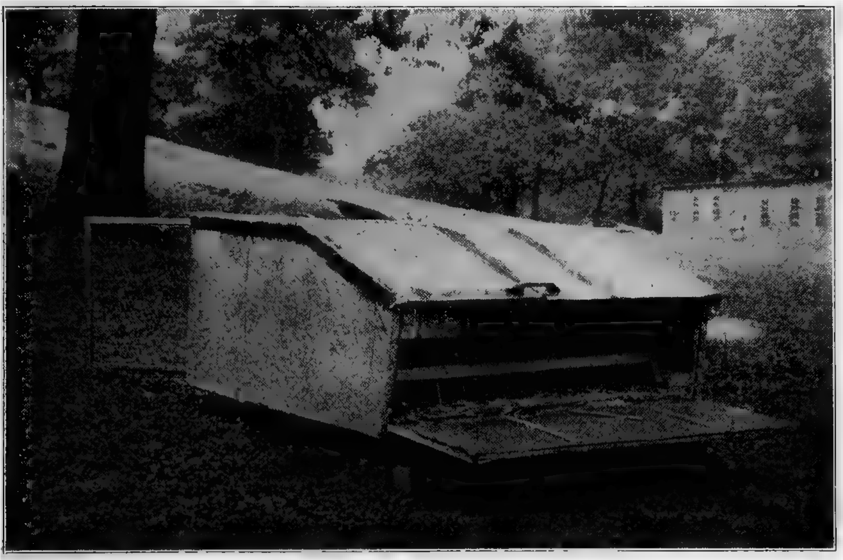
Front view of the Fool-Proof Colony House, showing the top window sash raised and the exits open. Good house for a city lot.

It will pay you to investigate and determine whether you can get better value for your money if you buy whole wheat, cracked corn or corn chop and kaffir corn rather than buy commercial mixed feed. Always buy clipped oats, if you use oats, as you do not have so much crude fiber and eliminate the rough hull of the oat which is disagreeable to the hens. We would not buy any ready mixed feed that had a lot of grit or weed seed in it. If you can buy a good clean scratch grain or dry mash, it is often much better and cheaper to buy such feeds already perpared. The advisability of such practice will have to be determined by yourself largely.

If your lot is large enough to afford a run for the fowls, you will find our Fool-Proof house well adapted to your purpose. It is a sightly home for the hens and would fit well into a back yard plan. If you have not sufficient ground for a run, you can use our town lot house. This house is admirably adapted for the care of a few hens for egg production. The roof on the shed in front can be raised to permit the sunshine to purify the soil and the interior of the house. The soil under this roof can be renewed often and will furnish a scratching and wallowing place.

The living room for the hens can be floored with concrete or a good tight board floor, and here the grain can be fed. It is better to have the straw on this floor than to throw the grain into the dirt.

The advertising that swept the country showing how hundreds could be made on a city lot by handling large numbers of fowls under intensive methods induced many to try a method that departed from nature and, as a result, many failures have been recorded. There is an intensive way to handle poultry, but there is certainly a limit to the number that can be kept on a small lot. Many of the monumental failures that dot the pages of poultry history were made because the owners tried to overdo the thing and handle more birds than their accommodations would permit. Many times even experienced poultrymen will make the mistake of trying to hatch more chicks than they have the room to care for properly.



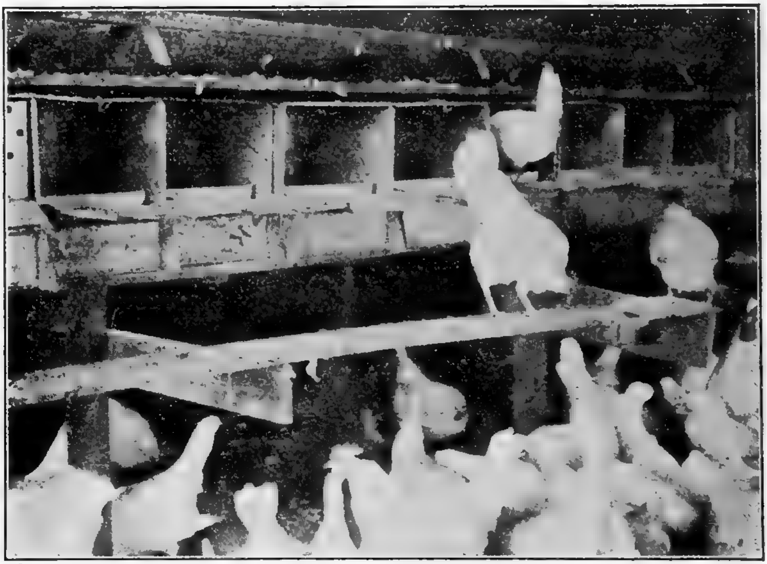
This shows the rear of a piano box laid down flat ways. You will note that the rear is made as if it was one large door and hinged at the bottom so that the entire back of the box may be opened as shown in the illustration. You will note the roosting poles in position on the interior of the box. These are built so that they can be removed at will. This rear door can be let down and the box easily cleaned from either the front or back. This is a very good coop in which to keep growing stock.

By all means, keep yourself within bounds and do not make your plans in such a way as to tax your capacity. Money can be made on a city or suburban lot by keeping such a number as the ground will accommodate, but you cannot afford to overcrowd.

Success is being made by some city poultrymen who pen the birds to force them during the winter strictly for eggs. It is possible to use pullets for forcing during the winter and then place them on the market after the laying season is finished.

Many may be able to utilize some outside building for this work and realize a good profit from producing eggs. Often-times, stale bread can be bought at a very reasonable price and many bargains picked up in the feed line that will enable you to run a hundred or so hens at a very cheap-rate. Be sure, though, never to feed them slop from hotels of which you know nothing. It might be possible to make arrangements with hotels or restaurants to save out scraps of bred, meat, etc., without pitching it into slop where it will sour, and thus get cheap rations for this intensive work.

We believe that if you go into the poultry work expecting to make your entire living from it that you had better get ample land on which to rear strong, vigorous flocks. It is possible to keep a large flock in a winter laying house even on a city lot. You can feed them highly nitrogenous feed and make a profit from them. You may be able to get green bone for a mere song. If you have a dynamo, grind your own bone and sprout your own oats. But you must get your stock from range raised chickens in order to stand the heavy feeding. You are not going to be able to use these hens as breeders and will be compelled to sell them at the end of the second season for eating purposes.



Trap-nests should be used by city lot poultrymen and by all those who are raising poultry in an intensive way, with which to trap-nest their breeding stock. Trap-nesting is really more important in intensive poultry culture than otherwise, for the reason that it is necessary to be relieved of every particle of dead weight, and to have every unprofitable bird eliminated from the flock.

We are giving you a statement below, which is a very good discussion of intensive poultry farming. Now, this is no contradiction to the advice that we have been giving you, for we believe that poultry in a small way will pay, but you cannot crowd your quarters and make headway, for the excrement from the poultry will soon poison the soil and you are in trouble, unless you use eternal vigilance.

"Intensive poultry keeping is universally regarded as unprofitable, both by commercial poultry keepers and experiment station experts. It never has paid continuously in the past and is not paying consistently now. That it cannot be made to pay in the future by improved methods and breeds is more than anyone can afford to say, but at the present time the risk of embarking in the business is enormous.

"And yet, the promises are often most alluring. Extraordinarily high profits on small investments with odd moment labor have tempted many persons with a speculative turn of mind to try for the same percentage of profits on large investments with hired labor. The inexperienced always fail, and the experienced never begin that way.

"The causes of failure are quite evident to anyone who makes a careful investigation. But your get-rich-quick poultryman seldom takes time to investigate. He thinks he sees a big fortune just ahead and that he had better occupy the field before a rival enters.

"In his hurry he fails to see the points of essential difference between the conditions under which good profits were made and the conditions under which his business will be conducted. But these differences are many and real.

"The man who makes a big success in a small way with his chickens is generally a man of experience. If not, he has studied the business in books and bulletins and poultry journals, has observed the breeds and methods of other poultry raisers, and has the happy tact of turning his study and observation to practical account. In addition to these qualifications he either does the work of caring for them as a labor of love and diversion, or sees that other members of his family do it rightly. Thus the cost of labor is eliminated entirely, and the best of care is assured. The amateur poultryman operating on a large scale has neither of these advantages. He is absolutely certain to have to pay well for his labor, and almost as certain to get pretty poor labor at that. If he does it himself, his time is an item of expense and his services are likely to be so also. If he trusts the care and management to another he must pay well for it and take the risk of having the work poorly done.

"Again, the successful small poultry raiser generally knows his flock. His breeds are adapted to conditions of climate, site, and feed supply, and his individual hens are selected for vigor, stamina and egg production. If he sees fit to make changes, he does it gradually, keeping his fingers carefully on the pulse of the business and his hand on its arm. His chickens do not get sick and vermin invested, and his hens do not loaf on the job. He keeps every member of the flock busy—growing, breeding, laying eggs. Activity is the law of profit.

"The matter of feed is another thing that is altogether in favor of the small grower. The table and garden by-products of a moderate sized family will almost keep the flock without additional expense. With plenty of table scraps and a good garden with kale and mustard, a lawn of clover and alfalfa, a little corn grown here and a little wheat there, charcoal nd ashes from the furnace, finely broken crockery, additional expenses are light. The thousand-hens-to-the-acre man has to buy all these.

"Housing is another item in favor of the small grower. Many highly successful home poultry men raise their flocks in dry goods boxes that cost nothing and are placed around on the garden during the winter. All his hardy fowls want are shelter from the rough winds and a dry spot to roost in. The droppings are thrown on the garden and sprinkled with land plaster, and the whole 'house' is sweet and clean. Of course his hens are hardy and eager to lay. And incidentally, the garden is improved almost one-half.

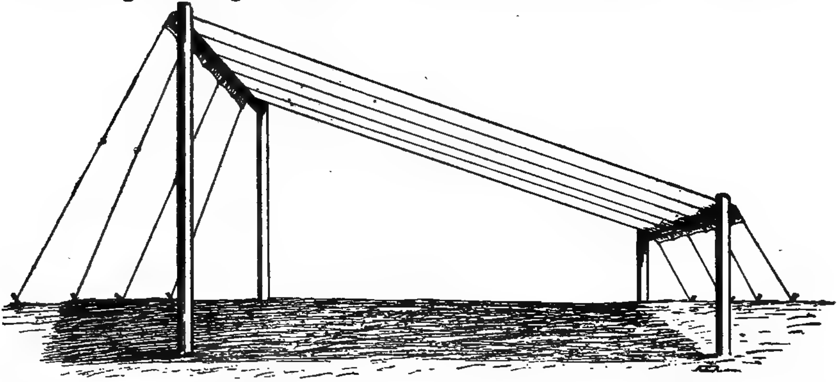
"And most of all, the successful small grower is sure of uncontaminated ground. The extempore 'colony houses' are moved about over the grounds into clean places. Should they become filthy, they are burned and replaced without cost. If more substantial houses are used, they are small and easily cleaned. Disease is banished. Vermin are kept down. The flock is neither depleted by death nor weakened below the egg-laying point of vitality. The hens succeed and therefore the owner succeeds.

"But the conditions under which his little business and pleasure poultry keeping is run are as different from those of the inexperienced intensive grower, as the housewife's home is different from that of the hired cook."

Our two-story Fool Proof house is well adapted for the intensive feeding work. It is a good idea to allow hens kept in close confinement to have a piece of earth in which they can scratch and wallow. It affords them a change to be able to leave the roosting quarters and go to a new place each day. The change is helpful. Such a house stocked with good layers could be made profitable if handled right.

You would have the advantage of having your market at your very doors and in many cases you can buy cheaper feed than if you were several miles from the city.

There are many ways for you to satisfy your ambition to have a few hens and this is one way. Such a plan as this would be a preparation for the handling of a larger flock on some farm that you have in mind.



This poultry shed is four feet high in front and two feet high in the rear. Ordinary poles with a cross bar are used for both the front and rear to hold the muslin, canvass or cover in position. The cloth is then staked down with heavy strings or light weight rope, the same as you use for staking down a tent. Canvass or drill would perhaps be the most economical in the end for if such covers were properly taken care of they would last through several seasons. The poles should be driven into the ground and should be about three inches in diameter or made of 2x4's. The cover is not fastened to the supports but is held in place by the small ropes which are fastened at each end by either sewing the ropes into the edge or clinching tent eyes into the edges of the canvass and running the ropes through these. Ordinary burlap makes a very satisfactory cover. These shade devices should not be built larger than 9x12 feet and it is sometimes best to make them smaller than that and use more of them, depending upon the size flock one must care for. If you have no natural shade for your poultry, provide it in some such way as this.

## THE SUBURBAN POULTRY LOT

There is greater need for a movement to the village than there is for a movement to the farm. In other words, there is an opportunity for the man who lives in the city, who wishes a small piece of land in the suburbs, or becomes a commuter, and a need for factories in the small towns to permit those who work in them to have a small piece of land and homes near by in order that they may have the home garden, a cow, and a few hens to cut the price of living. There is no doubt but that if such opportunities were afforded the factory workers, that we would have less discord between the factory owner and the men and women employed to do the work.

The suburban dweller, who has more ground than the city lot poultryman we have just discussed, has a big chance for the marketing of his surplus. In many cases he can deliver his own goods direct to the people among whom he works. Here he saves much that increases the profit from his work.

His opportunities are bigger, for he can really combine all branches of the work if he happens to have a wife who is willing to help him. This aid he will need, especially in the hatching season. It is possible to combine some kinds of garden work with the poultry and by selling this truck be able to make part of the feed bill. Irish potatoes fit well with the poultry work, as the fowls do not bother them. The manure from the poultry will soon make the ground very rich and it is possible to grow a big crop on a small piece of ground.

## MANY OPPORTUNITIES FOR PROFIT

There are many lines to which he can devote his attention. It is possible to grow baby chicks and sell a great number to near by people in the hatching season, if the owner happens to have some one who can assist in taking care of the machine. It is possible to build up a flock of good layers and advertise eggs for sitting purposes and bring up the average price per dozen. There is always a surplus of aggs in the spring months when good prices can be had for hatching eggs. You need not ask such big prices and you will be able to sell many to people near by and save the trouble and expense of shipping.

Each year I would purchase my male birds from pedigreed layers, for we are going to assume that you cannot trap-nest your own stock. You should trap-nest one pen of your own breeders. If you have restricted quarters you may not be able to rear your own stock to replenish each year. If this is the case you might farm out a few of your eggs to farmers who could rear you enough stock to replenish and they could have larger areas over which to roam. If you have an acre, this will not be necessary and you can, by growing crops, have fresh soil over which they can run.

A hundred hens well cared for on this acre, by the man who works in the city and lives in the suburbs, will show a mighty good profit. You are going to buy some feed and will not have so much waste stuff on the farm, but your prices will be so much larger that you will run your gross sales much higher than does the man who lives far from the city and must sell to the village grocer or ship by parcel post.

## GETTING A START

In making a start, it is better, even if you are going to keep but a hundred hens, to buy a few, probably one pen of ten, and rear your own stock. Get good ones even if you have to start with a trio. If you expect to make a specialty of birds for the show room, it is better to get your start from a breeder who has been winning in the shows. If you want birds for eggs, it is better to get your start from a breeder who has been mating birds for eggs. Baby chicks, in many instances, can now be bought cheaper than you can hatch them. If you buy chicks, make sure that they are from the best of stock in quality and egg production.

In handling your hundred hen flock we have given you a number of houses from which to make your selection. Be sure in handling a hundred hens that you have a pen of ten of the very best selected in order to breed a better flock each year. You will, by this means, continue to grow and not remain at a standstill.

You have made a study of breeds and should be able to make your own selection that will best suit your needs.

It is better to have the double yarding system or four yards so that you can run the fowls in one side while one is being planted and then make a change when the stuff planted in the first yard will permit of the hens being turned on it. By using good judgment you should make a good profit on the stuff you grow and keep the ground from becoming infected by the constant use of ground that is not stirred.

After a crop like potatoes or corn is taken off you can plant your green crops for winter. This will largely depend upon the section in which you live as to what to grow.

Here is the kind of farming where a portable hover can be used to fine advantage. It is better to use this method rather than build a brooder house which can be used only a short time each season.

You should cull early and place many, if not all the cockerels, on the market, except a few that you want for your own use, so as to not crowd your quarters, either house or ground. There is not much money in rearing cockerels and selling them at a dollar each, a price at which many go. If you have ample ground and can make use of the lesson we have given on caponizing, it may pay you to keep them over, but this will depend largely on whether you have ample range. If your quarters are limited do not attempt it.

Do not make the mistake in your work of overcrowding and trying to handle too many on small acreage. This is one of the places where many enthusiasts fall down.

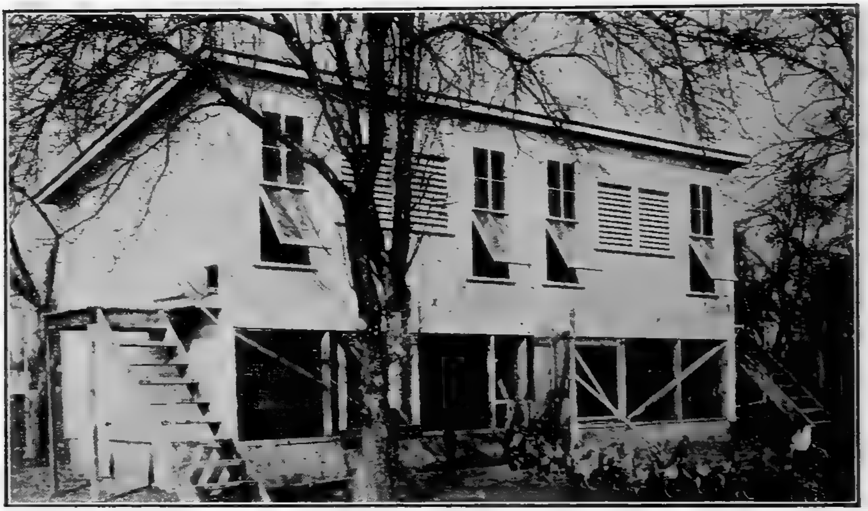
Hatching in the spring gets to be fascinating and while the enthusiasm is high you are apt to allow it to run away with you and overdo the thing.

## CROPS TO GROW

As lands become more high priced there is an increasing necessity of a more intensified system of agriculture. Many people who now live near large towns have the possibility of buying five or ten acres and are not able to buy more land than this. Can you make a living on this amount of ground?

By combining poultry with gardening of some kind and keeping the land continually at work there is no doubt but that a good living can be made in this type of farming as can be made from many large general farms far from the market and certainly with less worry, and it will afford many advantages of being near good neighbors and modern conveniences.

The corn club boys of the country seem to find little trouble in making 100 bushels of corn on an acre of ground. Some have gone away over the 200 bushel mark. It is certainly possible for the poultryman, with plenty of fertilizer from the hen houses, to make the maximum amount on an acre. He could produce 500 on five acres or a thousand on ten acres. He could, with the ten-acre plot, make enough feed for his five hundred hens, or over half enough on the five-acre piece.



For a large flock of layers which you wish to confine to a city or suburban lot, there is nothing much better than a two story house similar to that illustrated above. If the hens are intended only for layers, they can be confined to this style of house for the greater portion of the year. The upper floor is of boards, and the lower floor is of earth which can be renewed occasionally, or air slacked lime sprinkled about to purify same. It matters not how bad the weather, they have access to the earth where they can scratch and wallow to their hearts' content. The lower portion of the house is left open, and simply covered with a wire netting. There is an opening in the floor in the front portion of the house with a runway leading to it so that the birds can pass from the first to the second floor.

It would not be well, however, to plant all of the ground in corn, but follow in a good rotation. Higher priced crops could be raised on some of the land. In many cases, large quantities of Irish potatoes could be raised. When wheat is planted, in many climates, a fine hay crop or a crop of cow peas or soy beans can be raised after the grain is taken off, and thus frunish either green food or grain for the fowls.

The surbabanite poultry keeping should interest many, as the investment is small and you could probably buy an acre near the car line of a good city about as cheap as you would a lot in the city. You could cut the living expense by having no water rates to pay, your taxes would be less and the living expense would be reduced to a minimum.

This character of work would enable you to make sure of your way by growing into the poultry work rather than make a straight leap from the town or city job to an equipped poultry farm.

When we state that a hundred hens is a good unit for an acre of land we do not mean that this is the maximum carrying power of an acre. In the intensive system many more fowls than this can be kept with safety and profit. The 100 hen plan is where you are using ten or more acres. It is possible, under intensive methods, to keep as many as three hundred hens with comparative safety; if the birds are shifted often the ground can be thoroughly plowed and crops grown on the land to use up the droppings.

This is a shelter built out of ordinary poles. In No. 2 you can see the hens wallowing in the dust and shade beneath the poles on a hot summer day. In No. 3 you can see the hens sitting on top of the same poles when the weather was more or less damp and cool. In No. 1 of this same illustration, you can see the poultryman spading a few shovelfuls of earth in the poultry yard. You will note the hens about his feet eager to get at the bugs and worms. If every poultryman would spade up a few shovelfuls of earth in his poultry yard, every two or three days at least, he would find his hens would get a great deal of pleasure out of working in the soil and also be greatly benefited by same. This is especially recommended where the yards are bare or where your feed is lacking in meat food. City lot poultrymen should practice this method, both with young chicks and with their hens.

We believe that it is better to have every foot of the one acre intensive farm plowed. By doing so, air and sunlight is admitted and the soil freshened, and the sunlight helps to kill many of the disease germs.

The two-story Fool Proof house can be used with openings into two different yards. If you plant corn, ample shade will be furnished and the ground will be profitable. It would pay to sell corn as roasting ears if you are near a market and by so doing you can get the ground in shape in ample time to allow the peas to grow and bear. Then you can follow with wheat. On one side Irish potatoes can be grown, if the soil is suited. This makes a very profitable crop, and there is no better fertilizer for potatoes than the droppings from the fowls.

Succulent foods, such as cabbage, beets, mangos, lettuce, Swiss chard, kale and a variety of similar roots and plants can be grown for the use of poultry. A large quantity of these succulent foods can be grown on a very small piece of ground. The runs and yards should always be seeded to wheat, rape, or barley, whenever the fowls can be kept out of the yard long enough to give it the proper chance to get started. The birds will soon eat and kill out a growing crop by close grazing. If you find any trouble along this line, it is a good plan to seed a small plot to some quick growing crop, either kale, rape, wheat, or oats, and cover it with a frame about six inches high and having a top of one-inch poultry netting over the same. This will permit the crop to get a good start. The roots will be protected so that the plants will keep growing and providing a continuous and abundant supply of succulent green feed for several weeks.

In running this more intensified system you should have ample breeding pens of high record hens so that you can sell many eggs at good prices. It is presumed that you will have more time for this work than you would if you had a much larger acreage.

## COST AND PLANS FOR FIVE ACRES

Let us assume in making our plan for a five-acre farm that you are locating on $50 land and that you will sell either to some near by city or that you are going to ship to New York City or Philadelphia. Your average price for market eggs will be about fifty cents net. We give these figures as safe. You should sell many sittings of eggs from your pure blood stock which should in reality run the average price much beyond this. We will assume that your hens will lay 10 dozen eggs each. This is away below the average production of the hens in our laying contests when all breeds were included. We see no reason why you should not run a bigger average than this, but we want the figures safe.

We estimate the cost of the farm, dwelling and equipment to be about $2,500. You should have at least $250 reserve fund to carry you until the pullets begin to lay in the fall to furnish a revenue on which to live. If you have $1,000, you can most likely carry a mortgage on which you will pay interest the first year, but each year afterwards can reduce the payments as much as $350 per year. It is better to allow yourself ample time to clear up this mortgage as we never know what accidents come to cut down the probable earning power.

It seems that in five years, however, that you could clear enough to pay out of debt. The sales from the male birds should nearly pay the actual feed cost or reduce the feed cost to about 25 to 50 cents for each pullet reared to be placed in the laying house.

Each colony house with 400 young chicks should be so placed that the birds will have an acre over which to range. If this ground is cultivated you will raise a crop to help carry the expense and at the same time keep the soil in fine condition. It is possible to grow an acre of corn and an acre of Irish potatoes to run the household for the winter and even have some to sell. One acre can be used for raising crops best suited to the section in which you live and one acre can be set in fruit trees.

One acre on which the house stands can be used for the home garden, barn and fruit trees. The rest of the five acres can be cut in one-acre lots and a poultry house built to accommodate five hundred layers. The one acre, on which the house stands, can also be arranged to accommodate a few of the very best hens you have from which the flock can be renewed each year. In this way, you can gradually improve the flock. You can run male birds with the entire flock during the breeding season and sell many eggs for hatching. It is better in this case to sell eggs at moderate prices ranging from $1 to $3. You will make more than by trying to carry so many pens and advertising at higher prices.

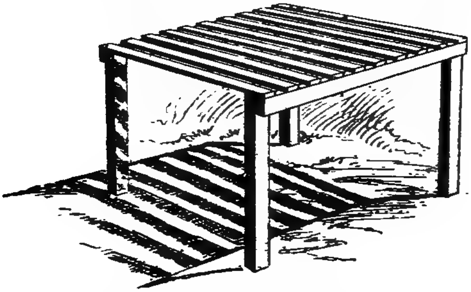
You should, for this reason, be able to get a better average price for the eggs from five hundred hens than you can when you run the number to one and two thousand.

You are saving house rent that you must pay in the city. You will soon be able to have your own water works by using an engine and having a storage tank. Your garden and the cow cut out much expense and reduce the cost of running the table.

By adopting five hundred hens as your unit for a laying flock, 400 chicks as your unit in your colony houses and 100 hens as the unit per acre for the breeding stock, we believe that you will follow a conservative course and one that will make for success if you will apply yourself to the work and use good judgment.

The Fool Proof house for 1,000 hens would prove desirable in many cases. Or, you can use the unit plan that we have given you and add as the flock increases. However, should you desire to go beyond the 1,000 hens, we advise that you increase the acreage of the farm.

We believe that you need more ground than five acres and are not advocating the five-acre plan unless land is very high and you are located very near an excellent market. As you get farther from the city and land is cheaper you should provide yourself with more ground than if you are near the market. The intensive cultivation for truck and the nearness to market will make this an important side line, but as you get farther from market the chances for making money in this way are lessened.



**This is a sun shelter made of elevated slats or poles. These are placed on a light frame and elevated on four or more posts. The frame is about two or two and one-half feet from the ground. Some use slats and others use poles and some prefer a solid platform. You will find that the birds will get underneath these on hot days and you will find that they take pleasure in sitting on the top of the shelter when the ground is wet and damp. Make them large enough to have a sufficient number of these shelters so that it will not be necessary for the birds to crowd.**

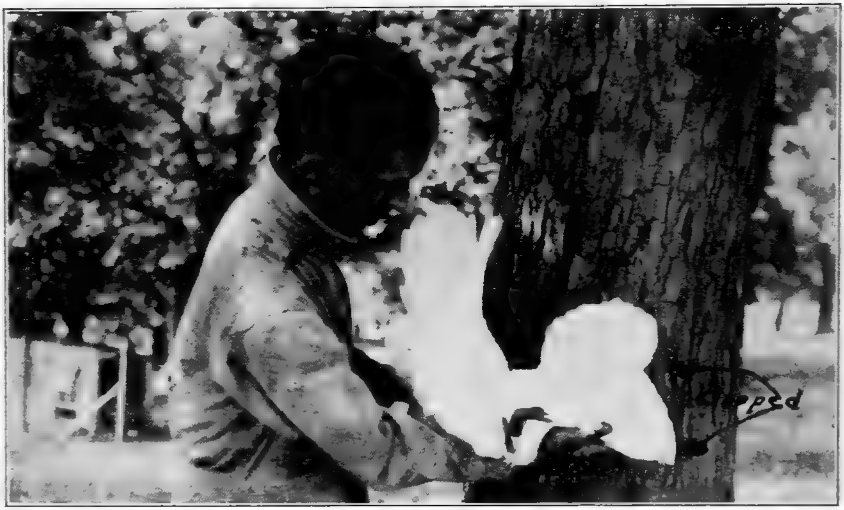
In planning the five-acre poultry plant we believe that it is better to increase the number of hens gradually. If you could, before taking up the work of managing a five or ten-acre plant, raise, while you are drawing your monthly check, at least a hundred choice hens to lay your foundation you could by the second year quite easily have enough pullets to make your living. By establishing a record with your hens for good laying ability you would be able to sell many eggs the second year for sitting purposes and bring the average price of your eggs to such a point that the hens would pay a good profit above the feed and cost.

It is better on such an intensive plant to be located near a good market. It is not necessary that you buy a run down poultry plant, but we believe it is really better to buy land without any poultry buildings, for the chances are that you will find them ill adapted to your purpose, and in many cases disease is in the soil, which will handicap you from the beginning. It is very necessary that you know your soil. If you do, then you can so handle it from the beginning that it will not become poisoned with disease.

It is better that your land be as near a square as possible, but this will not always be easily found. For this reason the plans we give you will not always fit your conditions. You must adapt them as near as possible. They merely furnish you a guide.

If you can buy land that has a run down orchard you will find that the running of poultry on the land will soon put the orchard in good shape, provided you spray and prune and keep it in good condition. Shade is certainly an essential.

It is better not to locate at the foot of hills or mountains. A place should be well drained and not be in a low, damp place. The hill sides will be well suited to fruit and give such drainage as to keep the soil in good condition. If it is possible to buy a place that has some hills or rolling land and, also, some land in the valley below where the feed can be raised, you will find it a practical plan. You could run the young stock during the summer on this land and keep from crowding the land too much over which the breeders run.



This illustrates our method of clipping wings of poultry to prevent them from flying and getting into neighbor's flowers or getting mixed in breeding pens. Only one wing of each bird is clipped and only the flight feathers in any case are clipped. The wing is cut as shown in the above illustration. The half of the wing feathers furtherest from the body are the only ones to be cut. The wing on the opposite side of the bird is not disturbed and in that case when it attempts to fly, it is unbalanced and falls to one side. By clipping the wing in this way, when it is folded by the bird, the clipped portion is folded underneath the one-half of the wing feathers which are not clipped and therefore does not mar the appearance of the fowl. Baby chicks which are inclined to be weak, also droop their flight feathers and if one-half of each wing is clipped in the same manner, you will find it will make a wonderful difference in their appearance and they also seem to do better and gain in strength.

The five-acre farm is very intensive. This acreage is best fitted to the commuter who wishes to continue his work in town and have the advantages of the country. It is possible for him to carry a few hundred hens with little labor, have his corn, fruit trees and orchard. By this means he can reduce the price of living and sell a few hundred dollars worth of poultry and eggs. In case you have such a plan in mind it will not be necessary to have an extensive equipment. The hen becomes the chief source of cash revenue and most everything is raised for the table.

The labor for caring for five hundred or a thousand laying hens during the winter is not excessive. If you have the house arranged so that the manure spreader or wagon can be driven right up where the droppings can be thrown in and carried straight to the field, with convenient feed hoppers that will hold enough dry mash for a month or more, and have the house piped so that there will be no carrying of water, the labor of caring for the hens will not take over two hours during the winter season. The labor, however, cannot be distributed over the year very well and most of it comes right at one season. The spring season is the natural time of incubation. If you are selling eggs for sitting purposes, there is much labor in packing eggs, answering letters, incubating and caring for the chicks. It is also gardening time at this season and in most cases help must be called in.

The one-man five-hundred hen farm can employ labor for this special season and use part of his time to raise the feed crops. However it is advisable to study your crop system well in order to properly distribute the labor. Grain crops fit well as the grain is planted in the fall and is not harvested until after the busy part of the hatching season is over. The rotations, however, must be planned according to the section in which you live and it would be hard for us to make a rotation that would fit the various sections. You can always secure aid of this character from your State Experiment Station.

## PLANS, ARRANGEMENTS AND ESTIMATES FOR A FIVE-ACRE FARM

The suggestions which follow, while not perfect or ideal, may be a great help in planning and arranging an intensive poultry farm or yards. The successful poultry farm should grow three crops, where possible, a green crop, a fruit crop and a poultry crop. If you can, grow poultry in the corn, as the chicks do best there. Corn, oats, wheat, alfalfa, clover, cow peas and fruit should be rotated in such a way as to provide shade, feed and fresh land each year. Every poultry farm should have enough land to produce at least all the green food which is required by the poultry. A small piece of ground will grow an immense lot of feed if planted in mangel beets. Move the chickens to fresh ground and sow the former yards with a mixture of wheat and oats or of rape. After these have grown several inches high you may turn the poultry in if you wish. Do not neglect to cultivate your yards and grow some of your own feed. The following plans and statements are taken from ideas suggested to us by Prof. Frank E. Mixa. We have varied only a little from his own statements and ideas. His figures and prices were all based on prices that prevailed previous to the war. Please make due allowance for that in making your own calculations and comparisons. Remember, while costs are higher that selling prices, also, are much higher.

Dealing with No. 1 first, we enter off the public highway; going about fifteen feet we enter through a twelve-foot gate; the first thing we notice on either side is a row of blackberries running to the boundary fence; as we go up the driveway we pass a privet hedge on the right; now we near the dwelling house, which we need not take up any space to explain, except that it contains five rooms and a bath and a light and well ventilated basement underneath for the incubator and the egg room. We prefer a dry concrete basement of twelve foot.

We have now come to the barn and noticing on either side a gate, we will pass through on the right side of the barn and go down to the breeding pens. While on the way down we will notice on the left the windmill (here there ought to be placed the pumping jack and engine room, if one were to put in a gasoline engine, then shafting could be run into the barn to run the minor machinery) and on the right we notice the large capacious yard, running from the breeding house, being ninety-six feet wide, that being the length of the house, and one hundred feet long, planted to apple and pear trees of recognized varieties, which are planted twenty feet apart and thirty feet from fences, thus leaving plenty of room for ease of cultivation.

Next on the left and on the other side is the water tower, which distributes water to the dwelling house, barn, feed room, killing room, incubator cellar, breeding and laying houses. Our idea is that it is better and cheaper to combine all these in one room, and have a basement under the dwelling and not go to the expense of a separate incubator and feed room.

On passing all these we will enter into the breeding pens and say a little about them. In every other pen is a hydrant, by which two pens are supplied by just simply opening the door between and filling the pans. This may seem an expensive idea; but on the other hand, when you stop to figure how much time each day is taken up in watering from thirty birds in this house to sixty birds in the laying house, to the pen, with all the rest of the farm work to do, you will stop and give it consideration, especially in summer.

A poultry yard is shown here where there is plenty of shade to protect the birds from the hot summer sun, and also shows clearly the fact that fruit trees and poultry can be grown on the same land, therefore, producing two crops instead of one. The coops, feed hoppers and drinking pans must be kept in the shade and every poultryman should plant trees for this purpose and it would be best to consult your nurseryman as to what he would recommend. Certain trees do well in poultry yards and others do not do so well and it would be best to consult your nurseryman as to what he would recommend for your particular locality. If poultrymen would plant some shrubbery, grapes, blackberry, raspberry, gooseberry or some such bushes in their poultry yards, so that the young stock and breeding stock can have access to same in the summer months, you will find they enjoy it very much. Chickens like to congregate beneath shrubbery.

In each pen is a mash hopper (home-made), a box of grit, shell and charcoal, with a loose piece of inch mesh wire to prevent the waste by scratching out of the box, and a dust box, which is of vast importance in egg production. The floors are heavily littered with a mixture of millet and oat straw or colver hay, but most always the oat or wheat straw is used pure, as the horse and cow will need most of the hay products.

As we have seen all that is necessary at this point, we pass on to the laying pens on the right. On the way over is field No. 4 where the colony houses are brought in for winter quarters, placing them in pairs, using one as a scratching shed and the other as a sleeping and laying room. The two are connected by a tube leading from one to the other, and the outer doors are made in rights and lefts so as to have an easy access to either.

Now, we enter the laying pens. The arrangement is the same, only there are two hoppers. While these pens are 16x16, those in the other house are 12x12, thus having two hundred and forty breeders and three hundred and sixty layers from which are to be chosen the breeders for the next year, as they have now reached their maturity and will be two years old when bred, and take the places of the old breeders, which are sold for market. The places of the layers are filled with late March and April hatched pullets.

The roosts in both houses are so anrranged that they can be hooked up during the day to keep the hens off of them, and while cleaning the droppings off.

The broody coops are used in the breeding pens to alternate the males every third day and in the laying pens in case of a broody hen or injured bird, as there are no males in these pens.

I have only one large yard on a side of each house. While only keeping one breed and variety, this is very desirable because it gives each bird about six times the space it would have in a small yard of given length and width of the pens; then, too, each bird will go to its own roost at night. I might say that all yards are planted to trees the same.

## ROTATION OF FIELD CROPS

Field No. 1 will be rotated with the following crops: First year planted to corn, second year to corn, and third to oats, while the fourth sown to clover.

Field No. 2: First year oats, second year cutting the rye, which had been sown the first fall as a forage crop for the cow, this being followed by oats and peas cut as forage and then sown to millet, which is cut as hay, plowed up and sown to winter wheat and vetches, third year cutting the wheat and vetches for forage, following it with rape, then millet cut as hay, fall plowed.

Field No. 3: First year oats and peas cut as forage, cropped with millet, which is cut as hay, (always using Hungarian for these late crops of millet, sown to winter wheat; second year letting the wheat ripen, plowing up and sowing to barley and peas, followed by cover crop of rye; third year, spring plowed, plowing under the rye and sowing to oats to ripen, after harvest plowing under stubble.

Field No. 4: One-half planted to mangles and one-half to cabbages the first year; second vice versa, and the third the same space (one-sixth acre) will be taken on field No. 3, and the old ground will be sown to oats.

The plot marked "Alfalfa Permanent" will be sown to a mixture of clover and alfalfa the first year, remaining so until the fall of the second year, at which time they will be sown to the alfalfa pure, and the third year remain permanent.

In the yard and orchard, corn will be planted with rape (Dwarf Essex) the first two years, and the fall of the second will be sown to wheat and vetches in some; and rye and vetches in others. The reason for so much corn the first two years is that the shade will be provided with profit; the third year the yards will be rotated with rank growing grains so as to provide an abundance of green food as long as the weather will permit the growing outside, after which this will be substituted by cabbages and mangels.

I might say here that in fields one, two, three and four the areas will not always hold true, because in order to have the same amount of straw each year, one piece will lap over into the other, as there will be no divisions between them, only I have marked them off in one acre, etc., for convenience of calculation.

The colony houses on the alfalfa plot on the left are for two families

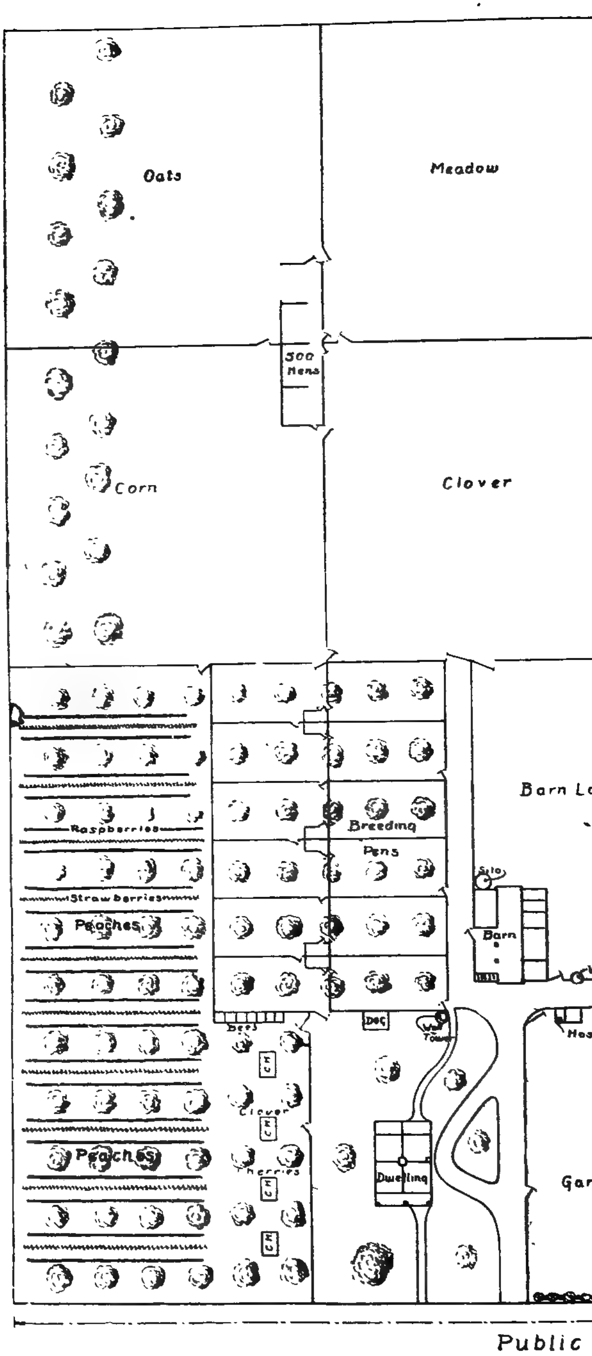
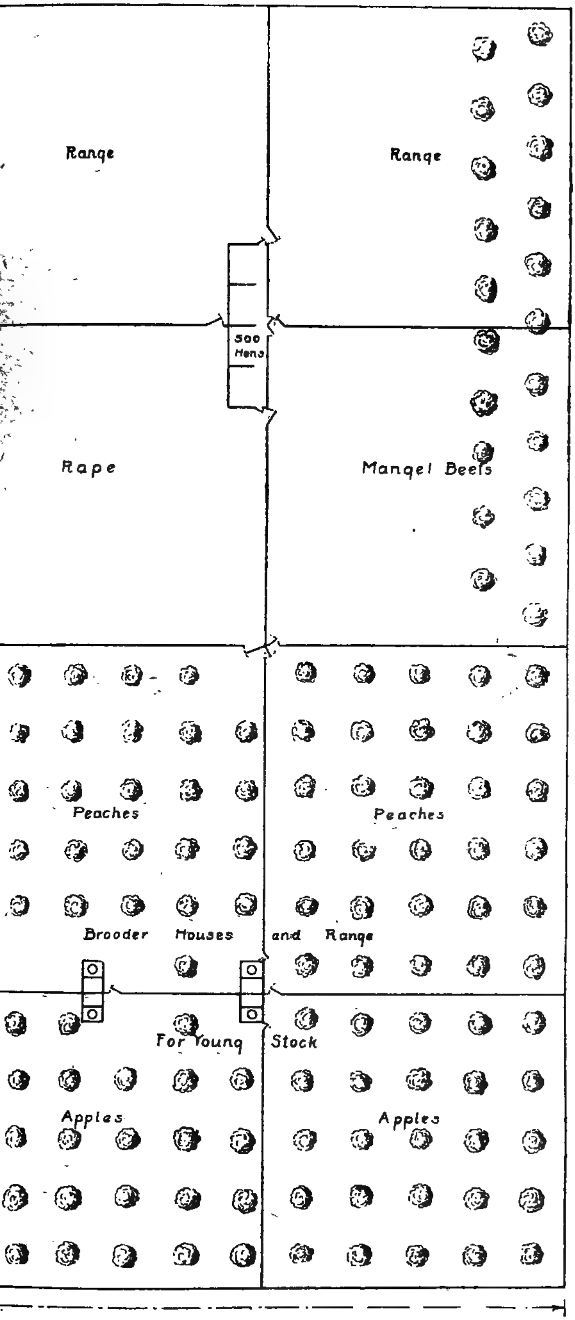


Fig. 3. The Ten-Acre farm is planned so that it can be used as a five, ten
faces the west. The description as given on other pages describes the san



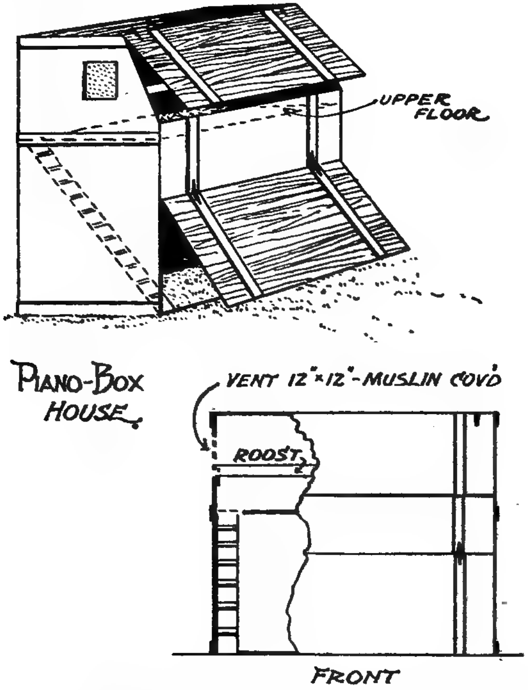
**nore acres. Saving steps is one of its merits. This farm as here planned lescribes it as if it faced east which it should do if lay of land will permit.**

of cockerel breeders, as this is necessary in line bred birds, and on the plot to the right of the breeding house is where the "Bachelors' Hall" will be placed.

## METHOD OF PROCEDURE FOR THE THREE YEARS

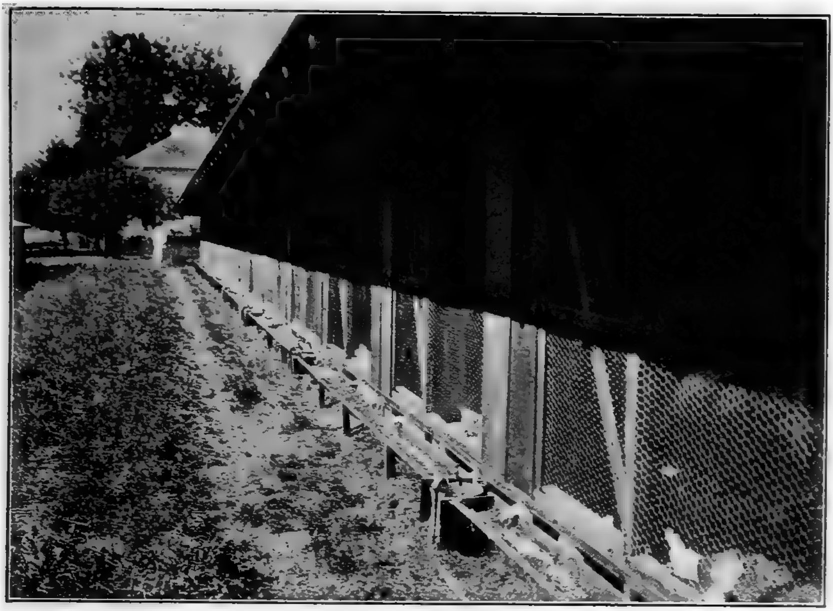
From the first of January there is no time to be wasted when one is intending to start a poultry farm. The first thing to do is to find out what you are after, then plan it out carefully in detail.

I intend first to get a line on some good utility stock with the prices right. As I have laid foundations in January, I shall try to get ready two pens in my breeding house to house birds, which I intend buying, about sixty in number, to start with. I shall try to have them at work by the first of February; giving them two weeks' rest after their trip, which I hope will be short, for the benefit of the birds, after which time I hope to get a fifty per cent production.



This is a piano box that has been converted into a house for a breeding pen. Such a house as is illustrated above can be converted from a piano box with very little expense involved. At about one-third of the height, the upper floor is laid. Six inches above the floor the roost extends from one end to the other. At one end of the floor there is a 10x15-inch opening, the long way being the full length of the box with the 10-inch slanting board extending to the lower floor. The fowls use this slatted, slanting board in ascending and descending to and from the upstairs sleeping room. The nest box is at one end of the upper floor. You will note that a 12x12 opening is made in the end of the box and this is covered with muslin for ventilation. You can also see the two doors that are made in front of the house so the doors can be lifted and both upper and lower floors easily cleaned. This makes a splendid little house for a small flock on a city lot. A small pen of Standard-bred chickens can be kept in such a house and be as snug as "a bug in a rug." There is a very small outlay required to begin poultry keeping in this way.

By the first of March the dwelling house ought to be very nearly finished so as to enable me to place my incubators in the basement, where the hatching will be done until my needs outgrow that room.



View of intensive system without yards on Week's Poultry Ranch in California.

The "Weeks Poultry System," one of the most intensive poultry systems in the world today. Forty-five hundred hens housed on six-sevenths of an acre and made to net $2.00 each per year above cost of feed.

The next job on hand is the colony houses wihch are to be used in brooding and rearing the chicks, six in number.

Buying two of the best standard incubators, 390 eggs capacity, costing less than ten cents per egg, and starting my first hatch on the first of March and the next hatch two weeks later, and so on until I have at least twelve hundred chicks, or rather filling the six colony houses, with the following results from each hatch; February, fertility seventy-five per cent, hatching seventy-five per cent, rearing seventy-five per cent—hatched first lot, two hundred and nineteen chicks and rearing one hundred and sixty-five; second hatch, March, fertility ninety per cent, hatching eighty per cent—two hundred and eighty chicks, rearing seventy-five per cent—two hundred and twenty chicks; third hatch will be the same, hatching two hundred and eighty and rearing two hundred and twenty; fourth hatch, April, fertility ninety per cent, hatching eighty per cent—two hundred and eighty chicks; rearing two hundred and twenty; fifth hatch the same fertility, hatching eighty per cent—two hundred and eighty chicks; rearing two hundred and twenty; giving a total of 1,339 hatched and rearing 1,045 or approximately about three eggs to each pullet reared.

Presuming that half are cockerels, five hundred and twenty in number, and five hundred and twenty-five pullets, the cockerels all being dressed for market, with the exception of about twenty, from which will be selected twelve for the following breeding season, and the rest sold as utility breeders. The pullets will be thoroughly culled until there are only three hundred and seventy-five left and marketed, dressed, and I will not sell a bird to anybody that I would not keep myself.

The estimated output of dressed produce is about twenty-six hundred pounds at an average price of twenty cents, amounting to $520.00, while the pullets retained, at $1 each, and the cockerels at $2.50 each, amounting to $375.00 for the pullets and $30.00 for the cockerels.

In the economy of building it is best to have more than one building going up at one time, so as to economize in labor and lumber. You will notice I have been building two breeding pens on the side of breeding pens as per drawing, dwelling house, colony house, and now I have the barn in course of construction, so I can keep a cow and a horse and have a place to keep wagons, feed, hay and tools needed on a poultry farm. We also include the workshop in the barn. The egg room and the incubator room are in the basement of the dwelling. By the first of September I intend to have the laying pens ready to receive the pullets into their winter quarters. Of course, this will necessitate having a lot of workers, but the sooner I get this done the better I like it, as I do not like the system of "just merely dragging along," as it costs more in the end by such process of construction and besides in order to have things come out right this is absolutely necessary.

Now that I have a place to keep both a cow and a horse, I will buy a good all-around horse for about $175.00 and a cow (Holstein grade) calved in March or April, for about $80.00. This will enable me to do my own plowing and hauling, while the cow will produce enough milk to give to my growing youngsters on the range, which will be mixed sour in a mash. This is the skim milk. The cow giving on an average of about forty pounds of milk per day and testing four per cent, I will be able to make about ten pounds of butter per week to sell. This will help to keep her, with a little profit on the side. This production of forty pounds will, of course, only be when I want it the most, which is in April, May, and June, while the rest of the months she will gradually fall off.

Turning to the pullets, their production, the first hatched in March and April, about one hundred and forty in this section, will start to lay in September with a production of twenty per cent, October twenty-five per cent, November twenty-five to thirty per cent, December thirty per cent, January forty per cent, February forty-five per cent, or an average of about thirty per cent for the six months.

The next sections of about two hundred and thirty-five, starting in October with a twenty per cent production, November twenty-five per cent, December thirty per cent, or an average for six months for first section and five months for the second is fifteen hundred dozen at an average price of twenty-eight cents in Missouri, making $420.00.

Considering now six warm months with an average per cent production for each, March fifty per cent, April sixty per cent, May seventy per cent, June sixty per cent, July forty-five per cent, August thirty-five per cent, giving an average of about fifty-three per cent. Thus for the three hundred and seventy-five the production would be approximately 2,980 dozen, at twenty cents, making $596.00 for the six months.

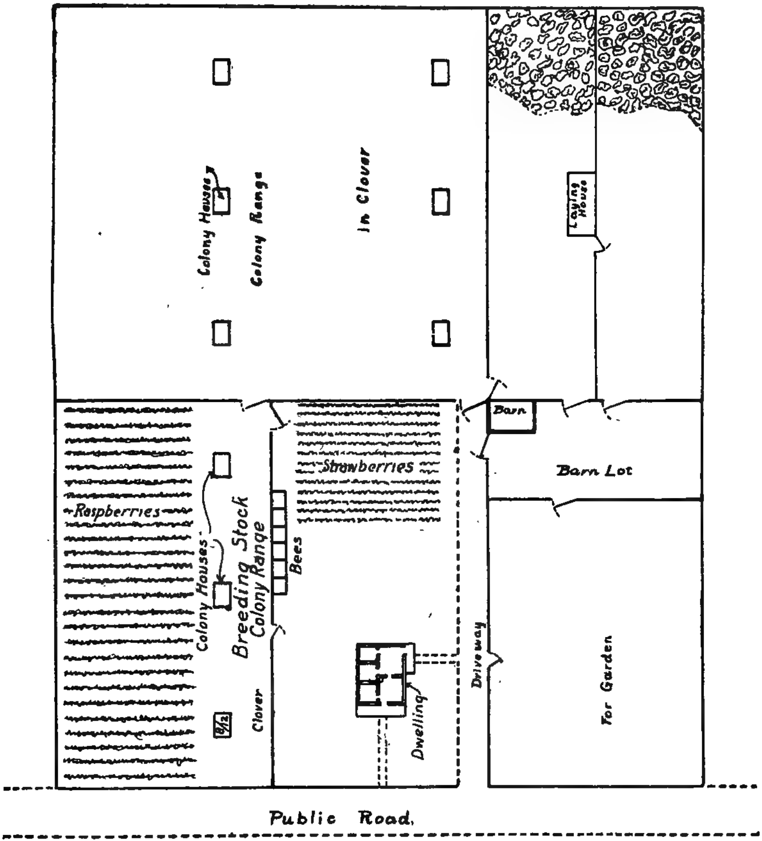


Fig. 4. This plan can be adapted to the small farm. It would fit well as a plan for a half acre or more.

Of course, we are all this time getting eggs from old stock from the middle of February to the middle of April for hatching, at five cents per egg, and then for market as per price given in other calculations. The first year we get the following income: One thousand nine hundred and fifty eggs at five cents, plus five hundred and twenty-five dozen at twenty-five cents, making altogether $228.75 from February first to January first.

The baker is glad when he can get eggs at a very low price, so having about twenty-one dozen, infertile, they are sold to him at ten cents per dozen, adding this $2.10 to the income.

## STATEMENT OF COST, EQUIPMENT, MAINTENANCE AND INCOME FOR FIRST YEAR

(You must understand that the figures and statements as to income, etc., are simply estimates of what can reasonably be expected. We make no extravagant claims, but give these figures for the reason that they may aid you and give you a basis from which to figure. Prices will vary in different communities.)

STATEMENT OF COST, EQUIPMENT, MAINTENANCE AND INCOME FOR FIRST YEAR

| | Permanent Fixtures Etc. | Expense Live Stock Etc. | Income |
|---|---|---|---|
| 60 hens (2 years) at $2.00 | | $ 120.00 | |
| 4 cockerels at $5.00 | | 20.00 | |
| 170 rds. fencing (enclosing the 5 acres) chick range and three sides of the laying yard, at 75c | $ 127.50 | | |
| Breeding house, $1.50 per hen (60) | 90.00 | | |
| 2 incubators, 390 egg, at $38.00 | 76.00 | | |
| 6 colony houses, 12x8, 15c per chick, at $30.00 | 180.00 | | |
| 6 brooder stoves at $25.00 | 150.00 | | |
| Appliances and tools, estimated at | 50.00 | | |
| Laying house for 375 pullets at $1.25 per bird | 468.75 | | |
| Dwelling house, 5 rooms and bath, and water and basement | 1,000.00 | | |
| Barn for hay, straw, horse, cow, tools, storage killing room, shop, etc. | 750.00 | | |
| 1 cow and calf | | 80.00 | |
| 1 horse | | 175.00 | |
| Harness, heavy wagon or light delivery | 125.00 | | |
| Drilling of well and windmill with water tower | 200.00 | | |
| Laying pipe and fixtures | 125.00 | | |
| Cost of hatching and rearing (fuel) | | 31.25 | |
| Feed for rearing 1045 chicks, 20c each | | 209.00 | |
| Feed for 375 pullets for 4 months at $1.08 per year or 9c per month | | 135.00 | |
| Feed for 60 hens for 11 mo. at 9c per mo. | | 59.40 | |
| Feed for horse and cow | | 140.82 | |
| Cost of plowing and planting (this year only) | | 50.00 | |
| Fruit trees and berries | 25.00 | | |
| 525 dozen eggs from 60 hens for 9 mo. at 25c | | | $ 131.25 |
| 1950 eggs for hatching from hens in 2 mo. at 5c | | 97.50 | 97.50 |
| 2600 lbs. of dressed poultry, av. 20c | | | 520.00 |
| 21 doz. infertile eggs sold to baker at 10c | | | 2.10 |
| 930 doz. eggs from pullets for 4 mo. at 23½c | | | 218.55 |
| 5900 lbs. milk for 5 mo. at 1½c | | | 88.50 |
| 236 lbs. butter, av. 25c | | | 59.00 |
| Calf sold, fattened | | | 12.50 |
| Manure from chicks | | 80.00 | 80.00 |
| Manure from hens and pullets making 162 cwt. at 40c | | 64.80 | 64.80 |
| | 3,367.25 | 1,262.77 | 1,274.20 |

## INVENTORY AND SUMMARY FOR THE FIRST YEAR

| | | Dr. | Cr. |
|---|---|---|---|
| Inventory— | | | |
| 375 pullets kept as layers at $1 | $375.00 | | |
| 12 cockerels kept on hand at $2.50 | 30.00 | | |
| 60 hens and 4 cockerels | 140.00 | | |
| 1 horse | 175.00 | | |
| 1 cow | 80.00 | | |
| Total | $800.00 | | $ 800.00 |
| Income | | | 1,274.20 |
| Total fixed charges (insurance, taxes, depreciation of equipment, etc.) | | $ 300.00 | |
| Expense (live stock, etc.) | | 1,262.77 | |
| | | $1,562.77 | $2,074.20<br>1,562.77 |
| Total income for first year | | | $ 511.43 |

## SECOND YEAR

In the spring I intend finishing the breeding pens, there being eight in all when finished, holding two hundred and forty birds in all. Perhaps it would not be out of place to mention the principal things that are not clearly shown in the drawing—for instance, the partitions, which are to be boarded up all the way in the neighborhood of the roosting closet, and the rest boarded three feet up from the floor to the roof and covered with cloth to prevent a draught.

The hydrants are located on the north side of the door in every other pen. There are three in the laying house and four in the breeding house.

If stone is not plentiful, the foundation can either be made of concrete or of building tile.

The rest of the fencing will be built this year, and the colony houses for two families of cockerel breeders.

## STATEMENT OF COST, EQUIPMENT, MAINTENANCE AND INCOME FOR SECOND YEAR
### SECOND YEAR

| | Permanent Fixtures Etc. | Expense Live Stock Etc. | Income |
|---|---|---|---|
| Addition to laying houses at $1.25 per hen | $ 250.00 | | |
| 2 colony houses fixed for breeders on range at $32.50 | 65.00 | | |
| 30 rds. fence inclosing breeding pens, at $1.00 | 30.00 | | |
| 8 gates as indicated on drawing | 25.00 | | |
| Seeds: Corn, rye, oats, peas, barley, vetches and alfalfa | | $ 15.00 | |
| Cost of fuel for hatching and brooding chicks | | 31.25 | |
| Feed for rearing 1045 chicks, at 20c each | | 209.00 | |

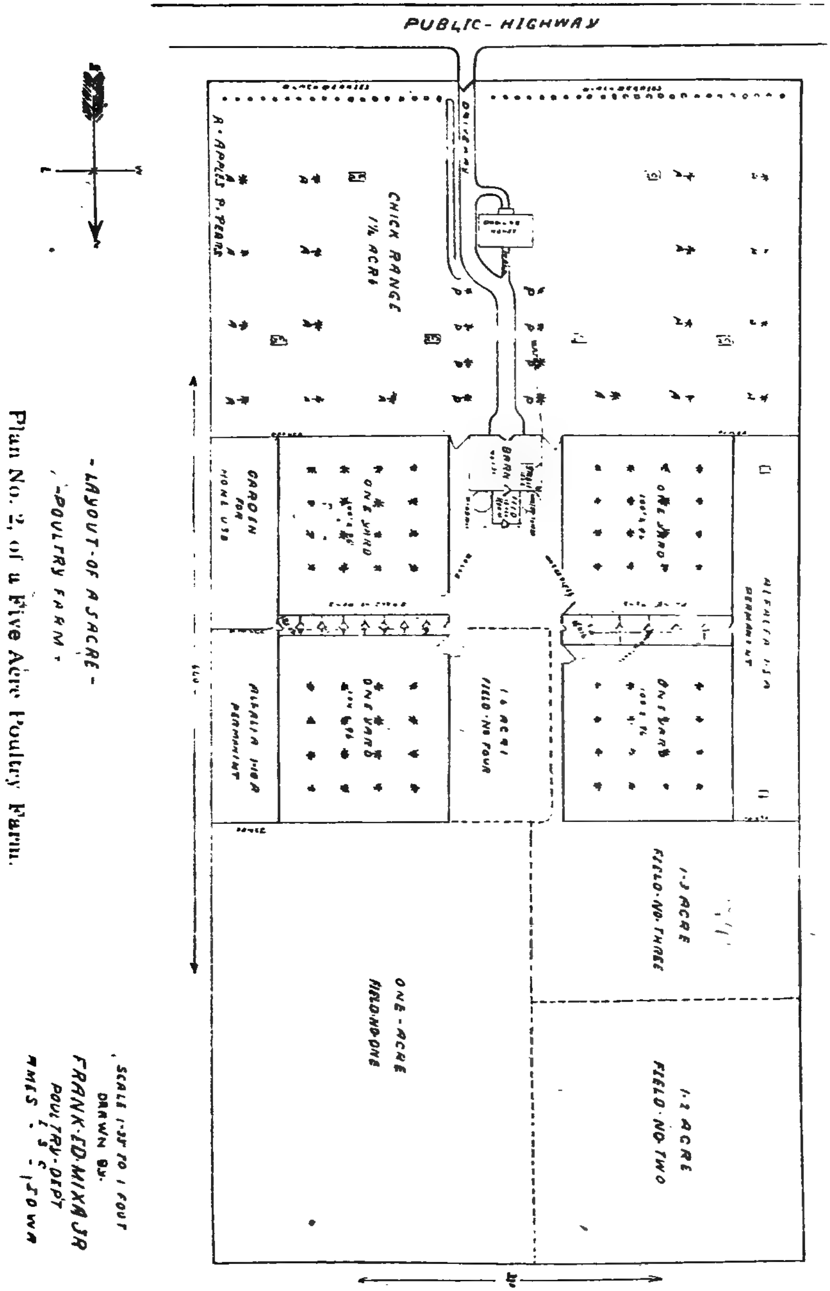
| | | | |
|---|---|---|---|
| Feed for 480 pullets for 4 mo. at $1.08 per year or 9c per mo. | | 172.80 | |
| Feed for 60 hens for 12 mo. at 9c per mo. | | 64.80 | |
| Feed for 375 layers for 12 mo. at 9c per mo. | | 405.00 | |
| Cost of feed for horse for 12 mo. at 24c a day (estimated) | | 87.60 | |
| Cost of feed for cow for 12 mo. (estimated) | | 53.22 | |
| 300 doz. eggs sold from 60 hens at 25c | | | $ 75.00 |
| 1950 eggs for hatching (kept) at 5c | | 97.50 | 97.50 |
| 2180 lbs. of dressed poultry, av. 20c | | | 436.00 |
| 12 cockerels that were kept over the first year at $5.00 | | | 60.00 |
| 21 doz. infertile eggs sold to baker at 10c | | | 2.10 |
| 3750 doz. eggs for 9 months at 25c | | | 937.50 |
| (The birds are now culled for breeding pens.) | | | |
| 195 culled layers, including the old 60 sold to market at 50 cents | | | 97.50 |
| 1200 dozen eggs from 480 pullets for 4 months at 23½c | | | 282.00 |
| 423 doz. from birds in the feeding pen at 23½c | | | 99.40 |
| 7800 lbs. of milk both fed to chicks and sold at 1½c | | | 117.00 |
| 318 lbs. of butter, av. 25c | | | 79.50 |
| 1 calf sold as bob veal | | | 6.20 |
| 16 cockerels bought to mate with 240 breeders at $5.00 | | 80.00 | |
| 1 cockerel to establish our strain of breeder, at $25 | | 25.00 | |
| 4 hens to mate with the above cockerel at $10.00 | | 40.00 | |
| Manure from chicks | | 80.00 | 80.00 |
| Manure from hens and pullets 162 cwt at 40c | | 64.80 | 64.80 |
| | $ 370.00 | $1,425.97 | $2,434.50 |

## INVENTORY AND SUMMARY FOR THE SECOND YEAR

| | | Dr. | Cr. |
|---|---|---|---|
| Inventory— | | | |
| 1 horse and cow | $255.00 | | |
| 17 cockerels and 4 hens | 145.00 | | |
| 720 birds on hand at $1 each | 720.00 | | |
| Total | $1,122.00 | | $1,120.00 |
| Income | | | 2,434.50 |
| Inventory of first year | | $ 800.00 | |
| Expense (live stock, etc.) second year | | 1,425.97 | |
| Total fixed charges (insurance, taxes, depreciation, etc. | | 368.85 | |
| | | $2,594.82 | $3,554.50<br>2,594.82 |
| Total profit for second year | | | $ 959.68 |

## THIRD YEAR

This year there will be a few eggs sold for hatching, as a better class of stock is on hand to select them from. The hens are now two years old, thereby being the proper age for breeding, because they can put all that is



Plan No. 2 of a Five-Acre Poultry Farm

needed into the eggs, whereas if they were pullets this energy would be divided, and not anly that, but you cannot get a big chicken from a small egg, which is essential when producing for meat.

Approximately there will be the same amount of chicks raised as the two preceeding years, as there are only four hundred and eighty pullets to replace each year, with the exception of what chicks are reared from the mating of the four hens and the cockerel. These chicks are hen hatched and hen brooded, and from this mating the cockerels will be chosen for the breeding pens for the fourth year. The breeding chart will be started, as there will be two families now.

In the fall when the pullets start to lay, places will be made for them by thoroughly culling over the layers to replace the old breeders. Thus, from four hundred and eighty layers two hundred and forty breeders will be selected, giving a good chance for thorough culling. (I have not mentioned that the six colony houses are used during the winter, accommodating twenty per house until the middle of March, when they are culled and put into the laying house, where also culling has been done to make room for them and the culls sold dressed for market. In some localities it is best to sell surplus market poultry alive. You can find out what your market demands and if you can dispose of dressed poultry to an advantage you can equip one room in your barn, which is really your administration building, or a spot in your basement for the purpose of killing and dressing poultry.)

## STATEMENT OF COST, EQUIPMENT, MAINTENANCE AND INCOME FOR THIRD YEAR

| | Permanent Fixtures Etc. | Expense Live Stock Etc. | Income |
|---|---|---|---|
| Seeds, for rotation and keeping yards green .... | | $ 25.00 | |
| Cost of fuel for hatching and brooding chicks.. | | 31.25 | |
| Feed for rearing 1200 chicks including the hen brooded .................................... | | 240.00 | |
| Feed for 480 pullets for 4 mo. at 9c per mo. .... | | 172.00 | |
| Feed for 120 layers for 3½ mo. at 9c each per mo. | | 37.80 | |
| Feed for 360 layers for 9 mo. 9c each per mo... | | 291.60 | |
| Feed for 240 breeders for 12 mo. 9c each per mo. | | 259.20 | |
| Cost of feed for horse at 24c per day ........ | | 87.60 | |
| Cost of feed for cow ...................... | | 53.22 | |
| 5150 doz. eggs for 6 mo. at 21½c ............ | | | $1,107.25 |
| 162½doz. eggs for hatching for own use ........ | | 97.50 | 97.50 |
| 1980 doz. eggs next six mo. before and after culling, at 22½c ........................ | | | 445.50 |
| 1200 doz. eggs from pullets for 4 mo. at 23½c .... | | | 282.00 |
| 20 doz. infertile eggs at 10c to baker .......... | | | 2.00 |
| 2260 lbs. of poultry dressed, av. 20c .......... | | | 452.00 |
| 1800 lbs. of hens dressed, av. 16c ............ | | | 288.00 |
| Sale of eggs, chicks, and cockerels of best stocks estiamted ................................ | | | 150.00 |
| Manure from chicks ........................ | | 80.00 | 80.00 |
| Manure from hens, 648 cwt. at 40c ........... | | 259.20 | 259.20 |
| 6500 lbs. of milk used for chicks and sold at 1½c | | | 97.50 |
| 260 lbs. of butter, av. 25c .................. | | | 65.00 |
| 1 calf as bob veal ........................ | | | 6.20 |
| Berries sold ............................ | | | 25.00 |
| | | $1,635.17 | $3,357.15 |

## INVENTORY AND SUMMARY FOR THE THIRD YEAR

| | | Dr. | Cr. |
|---|---|---|---|
| Inventory— | | | |
| 1 cow | $ 80.00 | | |
| 1 horse | 175.00 | | |
| 17 cockerels and 4 hens | 145.00 | | |
| 720 birds on hand | 720.00 | | |
| Total | $1,120.00 | | $1,120.00 |
| Income | | | 3,357.15 |
| Inventory of second year | | $1,120.00 | |
| Expense (live stock, etc.) | | 1,635.17 | |
| Total fixed charges (taxes, insurance, depreciation, etc.) | | 413.59 | |
| | | $3,168.76 | $4,477.15 |
| | | | 3,168.76 |
| Total profit for third year | | | $1,308.39 |

## COMPLETE SUMMARY FOR THREE YEARS

| | | Dr. | Cr. |
|---|---|---|---|
| First year | (Profit $ 511.43) | $1,262.77 | $1,274.20 |
| Second year | (Profit 959.68) | 1,425.97 | 2,434.50 |
| Third year | (Profit 1,308.39) | 1,635.17 | 3,357.15 |
| | (Total $2,779.50) | | |
| Inventory at end of third year | | | 1,120.00 |
| Total fixed charges first year | | 300.00 | |
| Total fixed charges, second year | | 368.85 | |
| Total fixed charges third year | | 413.59 | |
| | | $5,406.35 | $8,185.85 |
| | | | 5,406.35 |
| Total profit for three years | | | $2,779.50 |
| Amount invested in permanent fixtures first year | | | $3,367.25 |
| Amount invested in permanent fixtures second year | | | 370.00 |
| Amount invested in permanent fixtures third year | | | |
| Total investment in permanent fixtures | | | $3,737.25 |

If a proposition like this is properly handled, there is no reason why the profits should not yield a man a substantial income. That is, he would be able to make a good living, and in addition to that, accumulate a little money. If you are thinking of starting a five-acre poultry farm, it is possible to start with fewer buildings, a cheaper dwelling, less fencing, etc., than we have recommended for the completed five-acre farm. This is simply the ideal, and we have given you the maximum cost of building and equipping such a farm, and you can reduce the amount expended the first one or two years to correspond with the amount which you have to invest. If you have another position, you can use this temporarily as a side line and gradually build and equip your farm until the income from it will make you a comfortable living.

The meat and eggs will be sold locally, not knowing what large city this land lies near, but nevertheless the products will be put up in the best shape obtainable.

Nothing but the best is sold, because this is absolutely necessary with anyone just starting out in this line, in order to create a demand for your goods.

Of course, as the market demands more of my produce, I will increase the capacity as well as land and resort to a more extensive plan of brooding (as coal heated brooders), but will not eliminate rearing the chicks nor the breeders on range.

In my estimation, the less a chick is handled during its growth, the better are the results, as for instance, moving from one house to another and thereby giving a radical change, which is entirely against one of the fast rules in chick rearing.

The continual working of the soil will eliminate the contamination of it, which is very desirable in the successful keeping of poultry; therefore, I hope I have made myself clear with these words in closing, "nothing but the best" and "always the same."

## TEN-ACRE FARMS

We get many letters from people who wish to use the knowledge they have gained by taking up poultry farming as a life work. The question that presents itself is how many acres shall I use and where shall I locate. Petaluma, Van Nuys and Palo Alto, Calif., and Vineland, N. J., are examples of favored sections where the poultry business is the chief occupation and a place where many have succeeded and failed. The more people around you engaged in the same line of work, the greater are the chances for success. Marketing the products is an item and where many are carrying on the poultry work, co-operative marketing is an attractive feature and will enable you to secure better prices. Co-operation in this and other ways will go a long way toward insuring one's success.

Many of these communities that are so highly developed have very high priced lands and not every man has the money to invest in high priced land and at the same time have enough to begin the work by buying the proper outfit.

There are many promoters who have sold gold bricks to people in many parts of the country. You need to know your land by a personal visit and not buy from some land promoter. They often get double to quadruple of the value of the land and it will take you a long time to make enough profit to pay for your error.

It will not take you long to get your soil in good condition if it is capable of being brought up rapidly. Ten acres properly arranged with five hundred hens, a cow or two and a horse should make a living for a family, provided good markets are accessible, and you raise at least all of your green food.

The question is though, how shall you start on this intensive farm? Buy the stock outright or rear your flock from baby chicks purchased, or shall you buy eggs the first season and raise enough hens to put in the pens for the first year? If you have had some practice in incubation, it will pay you to buy the eggs your first season, which, of course, means that there will be very little profit the first year. If as many as two hundred or more pullets can be placed in the laying house the first of the winter you will be able to get ample eggs for hatching the first season and even sell some for hatching purposes.

## A TEN-ACRE ONE-MAN POULTRY FARM

This country is rapidly becoming thickly settled, and with the increase in population, the plan of farming is gradually changing from the extensive to the intensive.

Instead of a man owning 160 acres or more of land and simply making a living for his family and a small margin above as he did years ago, in this day and time of high priced land, if many are to farm at all, they must now be contented to own only ten acres and from the ten acres endeavor to make the same margin above a living. Thousands want to get away from the city and they, at least, want and are entitled to a comfortable living.

There are three parts to the unit of production, namely; brains, muscle and soil. In order to get maximum returns, it is necessary to have these three parts properly balanced.

In years past, when this country was new, our forefathers owned large tracts of fresh, fertile soil. It was not necessary for them to think anything about crop rotation or any other problem connected with the fertility of the soil. They had broad acres at their disposal and returns came easy even with slipshod methods of farming.

Their greatest problem was to get enough labor to till the fields which would produce large crops regardless of how they were tilled. Brain power was not thought to be necessary on a farm at that time.

Today things are different. We find a generally depleted soil, farm labor scarce and high, and a rapidly increasing population to be clothed and fed.

The first question which confronts the farmer of today is: "How much land should I own, in order that I may use my brain and muscle and get the greatest returns?"

This question at once suggests specialization, so the size of the farm will greatly depend upon the nature of the branch of agriculture which the "would-be" farmer intends to pursue. The man who is prepared and wishes to run a grain farm would need more land than if he wanted to run a poultry farm.

Not only the farmers are studying the intensive plan of farming, but many professional and business men are looking forward to the time when they will retire to a small farm. Many of them have acquired a competence and retire for the purpose of living a quiet, comfortable, happy life, in order to have employment which will insure a living for themselves and families, and a surplus to lay up for a "rainy day."

Many questions are asked today about small farms. Not only by people who are contemplating buying and equipping, but also by people who are on farms, wanting to know the best arrangement for buildings, rotation of crops, etc.

## THE FARM PLAN FOR TEN ACRES

Very few plans are carried out in detail just as was first planned, and the plans for the ten-acre farm, illustrated in another portion of this lesson, may be altered and changed, but we believe some of the ideas given can and should be incorporated in the plans of many farms.

Not all ten-acre farms are located just as the one described here, but the arrangement given here can be applied to almost any ten-acre farm, and altered to fit your land and your needs.

We consider that in form the ten acres should be in a square so it will conform to the equal division of land according to the government survey, being one-fourth of forty acres or one-eighth of a mile on each side, or 660 feet.

The buildings are as centrally located as is practical so that the farm operations may radiate from, yet circle around the base of operation, which is necessarily the residence, and the barn which is virtually an administration building.

There is an advantage also in having the buildings centrally located due to the fact that if the buildings were in one corner there would be three chances for others to build on the corners of their land and would be too close for the privacy of the farm, while with the buildings centrally located there is only one chance for another to build close, and that is directly across the road, which is not apt to be done.

## DESCRIPTION OF THE TEN-ACRE FARM

A road passes on the east side of the farm, taking fifteen feet off of the ten acres. The residence faces the east. One advantage in this is that as the sun rises it shines on the front of the house in the forenoon and in the afternoon it shines on the west part of the house, the advantage being that as the good wife does most of her cooking and kitchen work in the forenoon, then spends the afternoon and evening in the front of the house, she is therefore in the shady part of the house most of the day.

The residence contains a basement where the egg room and incubators are located. This is dry, light and airy and has the proper drainage and a cement floor.

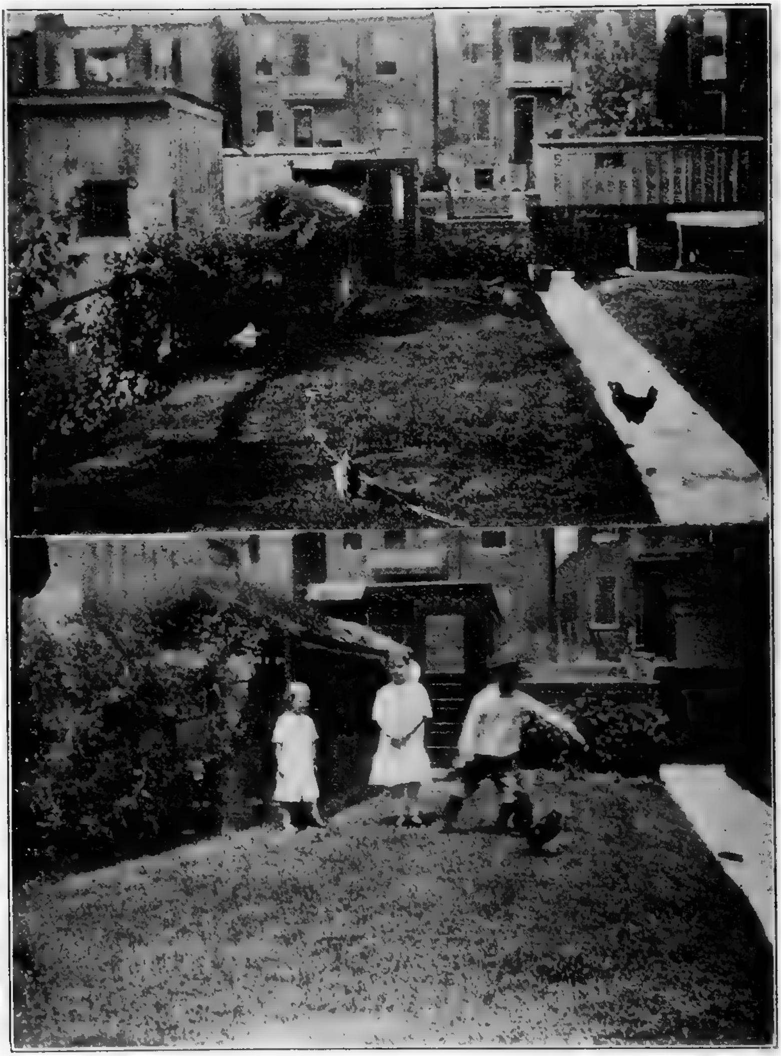


Fig. 5. The keeping of poultry does not prevent you from having a well arranged back yard. Vines, grass and shrubbery add to the happiness of the hens, as well as make the ground more attractive.

There are five rooms and an office in the dwelling which is considered large enough for the average family. A small room eight by ten feet is sufficiently large for the office. The desk, typewriter and supplies are kept in this room. Much of the correspondence will be done at night and by the desk being located here, the farmer can spend the evenings with his family, yet do all the office work necessary.

The living room is located on the south side of the house, thereby being cheered by the sunshine in winter and cooled by the southern breezes in summer.

The entrance to the farm is on the south side of the residence, thereby making a secondary front of the south side. This enables the family in the living room to see the approach of the man as he starts to or returns from town.

The roadway passes along the south side of the yard between the yard and garden, going straight to the barn which is west of the house. There is a circular roadway which passes by the residence for the purpose of unloading coal for the incubator, loading cases of eggs for market, etc.

South of the yard is the garden which is large enough to raise all the vegetables needed for the family. It is conveniently located, being close to the residence so the vegetables can be gathered without having to go far. Then, too, it is close to the barn so it can be fertilized with little effort, and any surplus pea vines, corn stalks, etc., can be fed to the stock in the barn.

The barn is large enough to accommodate one horse and two cows. It also has room to store feed, tools, implements, coops, etc., and also has a work room or carpenter shop where coops, nests, feed hoppers, egg cases, etc., can be made on bad days.

The barn lot is centrally located so there are no neighbors' stock on the other side of the fence to wreck the fence by fighting through. The stock can also be transferred to any yard on the farm by opening gates and without them ever being outside.

North of the residence is an orchard with strawberries and raspberries between the rows of fruit trees. Four colony houses are placed here for young stock after the berry harvest is over. There is a small silo in the rear of the barn. It is just large enough to hold the corn crop and furnish ensilage for the cows.

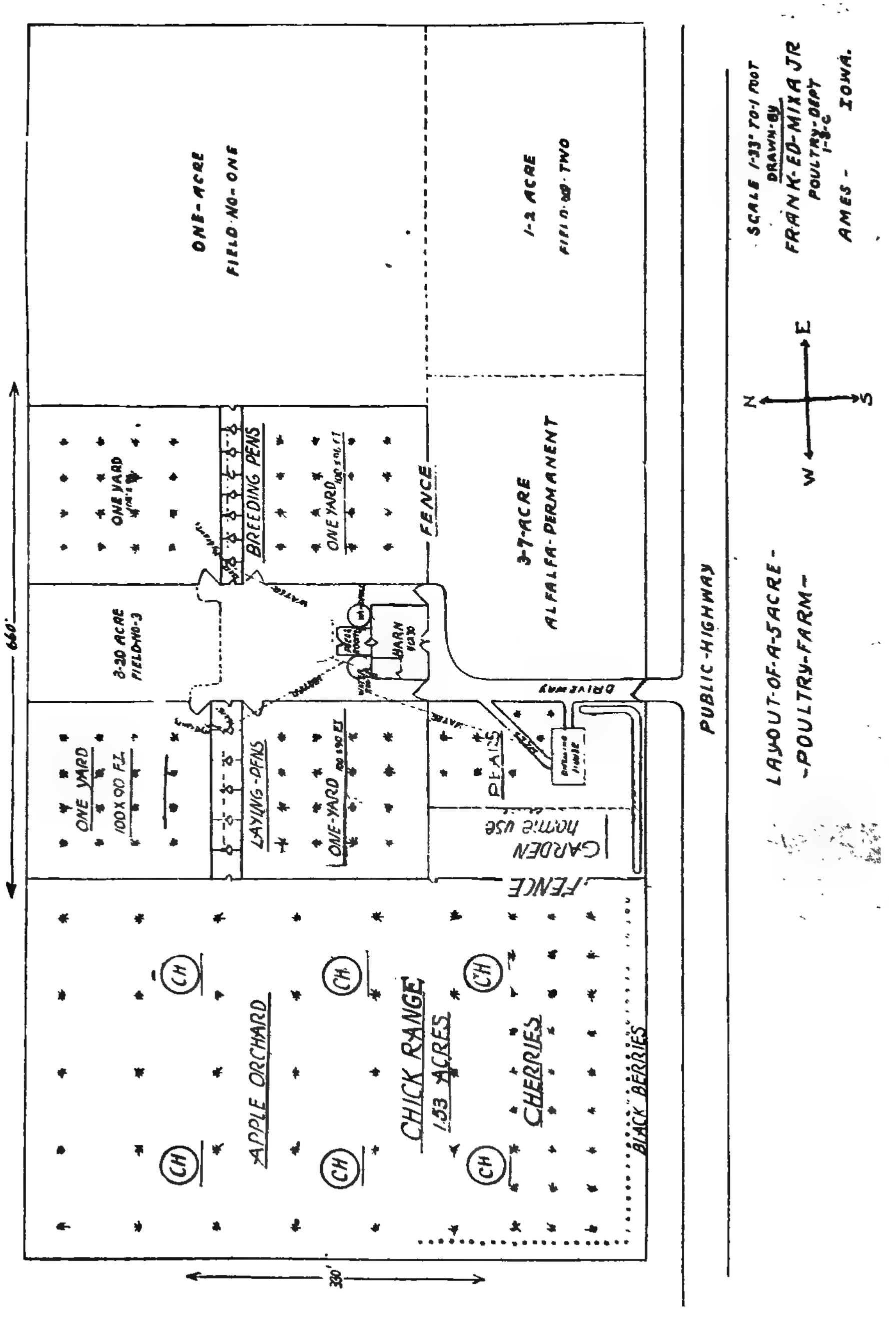
North of the barn and west of the yard are six breeding pens, which are thirty by one hundred and twenty feet, for fifteen birds each. The houses are located in the middle and on the line between two pens so that the house, being divided, permits one pen to run in each yard, by means of a temporary fence placed across the yards for each pen of hens. By alternating the yards, green food can be grown in one end while the fowls are in the other, and by keeping one pen in the north yard and the next in the south yard and so on through the yards, there will always be an empty yard between two pens of breeders so there is no danger of fowls injuring themselves by fighting through the fence. There are two exits to each room, one going to each yard, so all that is necessary to change yards is to close one exit and open the other at night when all the birds are in the house.

North of the breeding yards is an orchard with a colony house arranged for keeping some surplus cockerels to themselves.

It will be noticed that the six plots described so far is one-fourth of the ten acres or two and one-half acres. This arrangement will apply to any sized farm and is practical for any intensive farm.

The residence is protected on the north and west from the storms of winter, yet the southern breezes are permitted to enter, which make it cooler in summer and also carry the odors from the barn yard in the other direction.

Directly west of the plots just described is another square the same size, containing two and one-half acres. In the center of this plot is placed a laying house twenty by eighty feet, which is large enough to hold five hundred laying hens. We like the forty-eight by sixty-foot

LAYOUT-OF-A-5ACRE-
-POULTRY-FARM-
SCALE 1-33' TO-1 FOOT
DRAWN-BY
FRANK-ED-MIXA JR
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N
E
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PUBLIC-HIGHWAY
ONE-ACRE
FIELD-NO-ONE
1-2 ACRE
FIELD-NO-TWO
3-7-ACRE
ALFALFA-PERMANENT
FENCE
ONE YARD
BREEDING PENS
ONE YARD
3-20 ACRE
FIELD-NO-3
WATER
BARN
DRIVEWAY
DWELLING HOUSE
PEARS
GARDEN
home use
ONE YARD
100X90 F.T.
LAYING-PENS
ONE-YARD 100X90 F.T.
FENCE
660'
330'
APPLE ORCHARD
CH
CHICK RANGE
1.53 ACRES
CHERRIES
BLACK BERRIES

fool-proof houses better. This plot is divided into four yards and the house divided into four rooms, one room for each yard. The exits and doors are so arranged that the flock may have access to the entire house and all run together; they may be turned into one or more yards, just as desired. Or the flock can be divided into four parts of 125 hens each, and each part of the flock have one room and one yard. Or one-half the flock can have half the house and one yard. To make a long story short, the man can move his flock from yard to yard by opening and closing the exits at night when the hens are all in the house. In this way, the man can alternate his pens and keep green food growing in some pens while the hens are in other pens. This arrangement reduces the labor to a minimum.

It will be noticed, by referring to the map, that the two plots just described make a five-acre tract, which is the correct shape for a five-acre farm according to the regular divisions of land. It is ten acres divided so it makes two five-acre tracts so each will have a front on the public highway.

The arrangement given here with very few changes will apply to a five-acre farm. The south half of the ten acres is divided into two parts, each of which is divided into four pens. The west part, which is the southwest quarter of the ten acres, has the same kind of house and is arranged just the same as the northwest quarter which has been described.

The southeast quarter of the farm is divided into four pens in which are located two brooder houses. Each house is divided into two parts and each part contains a five hundred-chick capacity coal heated brooder stove. The exits are arranged in the corner next to the partition fence so the chicks can be driven into the house without trouble.

The well is located at the southeast corner of the breeding pens. Being located here, it is where the man will pass it oftener than any other place on the farm, yet it is not in the way. By passing it often, he can and will keep it in better repair and keep the tank filled with water more than if it was in some secluded spot. Above the well is a tank from which water is piped to all yards and buildings on the farm.

Bees assist materially in the fertilization of the fruit blossoms and also furnish a surplus of honey. Therefore, six colonies of bees are placed at the northeast corner of the breeding yards. By being located here they are in the midst of the orchard, but are out of the way where they will bother nothing and nothing will bother them.

The shade trees in the front yard are hard maple while the ones in the back yard are soft maple. The hard maple is slower in growth and makes a smaller tree than the soft maple, so we have the smaller trees in front and the larger ones in the back, which gives a better general appearance to the place. Then, too, a large amount of shade is needed in the back yard between the residence and the barn, and by having the larger trees we get a larger amount of shade with fewer tree trunks to be in the way.

The rest of the trees on the farm serve the double purpose of furnishing shade for the fowls and fruit for the family, or for the market.

The kinds of fruit trees are apples, peaches and cherries. The summer varieties are placed in the orchard directly north of the residence as most of the fruit will be used by the family. By being located here they will be close to the residence, and therefore little effort will be required to get the fruit just as it is needed.

The rest of the trees are placed in double rows running east and west along the north, south, and middle partition fences. This furnishes shade to each pen. The advantage in this arrangement is that the shade benefits the fowls and by being located away from the house will draw the hens away from the houses, causing them to range farther. Then, too, the house is open to the sunlight, which is one of the best germ destroyers and disease exterminators that we have.

## THE PLAN OF OPERATION

In order to get an idea of the advantages of the arrangement of the farm we should notice the plan for the man's system of work.

Leaving the residence he goes by the well and barn where any necessary chore might be done. From here he goes south through a lane which leads him into a yard where he can go into either of the brooder houses without going into any other yard or opening another gate. From here he goes directly west along the partition fence to one of the large laying houses. This is the farthest point to which he has to go and it is here that he begins gathering eggs, so that he carries eggs only on his return trip to the egg room. From this laying house he goes north along the partition fence to the other laying house, and from there he goes east to the breeding pens. The houses in the breeding yards are arranged with doors so he can go directly through the houses, and from the breeding yard he goes to the egg room in the basement of the dwelling. This completes the round of his work and he has traveled only about a quarter of a mile in visiting nearly every house on his place. There are only a very few places where the man will have to go which are not included in this circuit. One of them is the colony house north of the residence and the other is the hospital which is located in the west end of the garden. The reason for this location is that this place is visited less by other fowls than any other spot on the farm.

Only fowls which are afflicted in such a way that they would be good birds, if cured, should be placed here, such as broken bones, torn flesh, etc. Vines and flowers are grown about the hospital so that it is made one of the most attractive spots on the place. The birds that are convalescent have access to the garden at certain seasons.

## OBJECTIONABLE FEATURES

It is well to notice some of the objections and criticisms which might be offered.

The first criticism to be offered is the expense of equipment which would be $3 or more per bird, outside the cost of the residence and barn. Yet when we consider that this is the first cost, it is not so great, and by studying the plan it will be seen that a man can begin with only half of one large house and with one breeding yard and build to this ideal as fast as his circumstances will permit.

The amount and cost of fencing is another objection, but it is an investment, the cost of which is balanced against the advantages it gives the man, and amounts to a great deal, because it is a one-man farm which should be arranged so he can handle the flock by himself, and have the flock, houses and yards absolutely under his control.

Another objection is so many small yards, but it will be noticed that the yards are nearly all square, which contain a larger amount of ground with the same amount of fence than any other shape, which is practical. You will also notice that the arrangement of the gates and fencing can scarcely be improved upon.

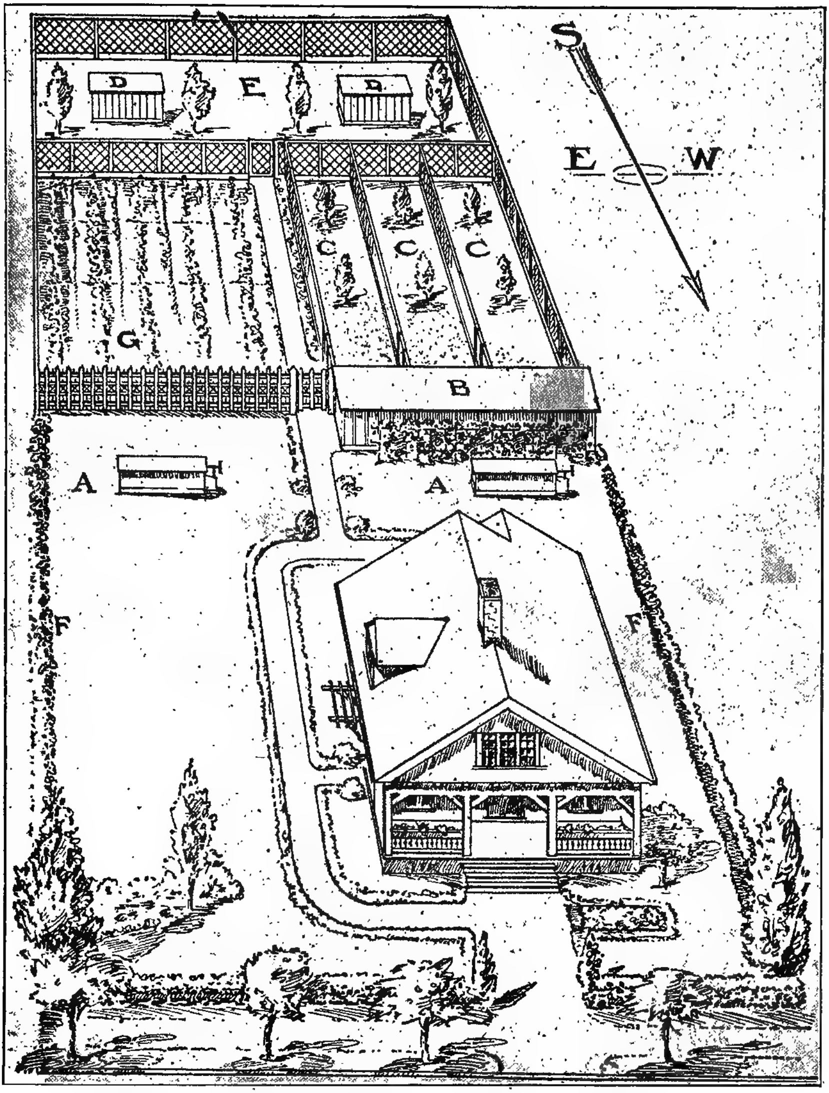
Another objection is that the farm is so small that very little feed can be raised on it, which necessitates the purchase of much of the feed. If the man makes a success he will not have much time for raising feed, for his time is more valuable doing something else.

The last objection is that it will keep a man busy all the time with very few holidays. The work can be arranged so it is not a drag and a burden, but so that it will be light, pleasant and profitable, although it will be regular.

## THE STOCK AND EQUIPMENT

The live stock used upon the farm consists of one brood mare, two cows, 1,000 laying hens and 100 head of good breeding stock. If any dog is kept it should be a good rat dog.

In addition to the apples, peaches and cherries, we recommend the use of strawberries and raspberries or other small fruit. By having a mammoth incubator this can be placed in the basement which is airy,



This illustrates a very good plan for a city lot poultry yard. You will note that the beautiful little home is surrounded by flowers, shrubbery, garden, berries, and fruit trees. A—shows colony brooder coops that can be temporarily located in the rear of the front yard, and the chicks kept there for some two or three weeks until they get a good start. They can then be moved back to the colony houses shown at D. B—illustrates the poultry house where the laying hens and breeding stock are kept. The house is partitioned into three parts with yards in front of each section. C—This shows the long, narrow poultry yards, two fruit trees being planted in each. One yard is constantly cultivated. Green food is started in the same, while the hens are using the other two yards. D—This represents two colony coops in which the growing stock is raised. E—This is the yard used for growing chicks, and at certain seasons of the year, when the garden is not in use, the chicks can be allowed to range in that by simply opening the gate which separates the two yards. The soil in yard E is continually cultivated so as to keep the ground pure and sweet. F—represents rows of hedge or shrubbery which separates the yard from that of neighbors. This adds to the beauty of the layout. G—This shows the family garden where a great quantity of choice vegetables for the table can be grown and the vegetable tops and under-sized vegetables may be utilized by grinding them up or cooking them for the poultry.

light and dry. This can be operated at a minimum amount of expense for fuel and would require less care and attention than would a number of small machines.

We have not given in detail the cost of each building or each item for the reason that prices vary so in different locations. The main idea which we wish to convey is the general arrangement for such a farm. While there is objection to small yards and so much fencing, yet this is an intensive farm and by having the land fenced in the manner in which we have arranged it, it will permit the owner to till the soil and grow his own green food and prevent contamination of the land. If the large Fool-Proof house, 48x60 ft. is used, it reduces the expense of building, and also lessens the fencing. At some seasons of the year, the owner could allow some of the fowls to range in the barn lot and, also, in the garden, and there is not a foot of land on the entire farm that is not utilized to good advantage. You will see by the arrangement of the yards, buildings and gates that the poultryman can visit every building upon his farm and still pass through very few gates.

Water is piped to every building and into every yard. The feed is hauled out to the poultry buildings and stored in hoppers and bins, so that it is seldom necessary to carry a feed bucket when feeding the fowls or the baby chicks.

In beginning to build upon such a farm, if the owner does not have sufficient capital to complete the entire equipment, including the dwelling house, barn, fencing, etc., he might build one section of the house for 250 laying hens and perhaps start with one breeding pen and one colony house, and a small amount of fencing. The owner might be located nearby so that the farm could be added to and equipped as circumstances would permit. Then, finally, have his dwelling and barn and administration building completed before he moved upon the farm for the purpose of giving all his time and attention.

We have planned this farm with a view of trying to be of some help to the man with limited means, who is anxious to enjoy the advantage of farm life and, at the same time, be prepared to earn a livelihood for himself and family.

The same arrangement will apply to a twenty or forty-acre farm as we have applied to this ten-acre plan. If you use a plan that is as intensive as this, the soil should be good. If the land is poorer and cheaper, make the yards larger so that the plan covers twenty or forty acres of ground instead of the ten as we have planned it.

We preach extensive farming, free range, freedom from fences, etc., which is all well and good, and we believe in those things as much as anyone can, but our population is rapidly upon the increase, and the time will certainly come when one acre will yield as much in this country and intensive farming will be as extensively engaged in as it is in some of the foreign countries. For that reason, we feel that we must sooner or later solve the problem for the intensive farmer. Then why not begin now? Anyone can make a success in raising poultry on the extensive general farm where they have free range and practically make their own living, but it seems that it is the duty of experiment stations and experts to try to solve the problem whereby a man with limited means can earn a livelihood on an intensive farm, or at least, earn a part of his living that way.

## A ONE MAN POULTRY FARM

How large is a one-man poultry farm? Is it 500 hens or 5,000? We would say that it all depends upon the system used. If a man attempts to make his place a breeding farm, 1,000 would perhaps be the limit. Here he would be expected to do some trap-nesting, brood his own chicks, sell some hatching eggs, breeding stock and baby chicks. If a person expected to run a commercial egg farm or an egg factory and bought all his layers as three months old pullets or yearling hens, if he used the right system, there is no reason why one man could not care for 5,000 layers.

Prof. Victor G. Aubry, of New Jersey, visited a number of one-man farms in his state and he tells the following interesting story about one of them:

William Longstreet takes care of 2,500 hens all by himself, and, what's more the bulk of his eggs he retails himself in Trenton, New Jersey. You will say: "Well, this man has not much time to himself." Nevertheless, he holds office in the Mercer County Poultry Association and seldom misses a meeting either of his local association or the state body, and, what's more, he is rearranging his buildings now to take care of over 3,500 birds.

A very common expresison in the poultry business is A One-Man Poultry Farm. What is it? Well, it's a poultry plant which is the maximum size in number of hens, for one man to take care of. It is without doubt the most efficient type of poultry keeping, when figured from the angle of profits per bird.

Regarding the size of a one-man plant, answers will be given varying in size anywhere from 300 to 2,500 birds, and these answers are correct because you see just that condition in the one-man poultry farms.

You see the fellow who has from five to six hundred hens, who is so busy that he has not the time hardly to speak to you, never gets out to meetings or anything like that; never has any slack seasons and generally this man's place is untidy and seldom picked up. His incubators, if you visit him during the summer or fall, are exactly as they were when the last hatch came off in the spring. The incubator cellar or room, immediately after the hatching season, becomes a catch-all, in which you are likely to find almost anything from a dry mash hopper to a spray pump. The brooder houses are just as they were when the chicks were weaned, the stoves and hovers being used by the growing birds for roosts; the whole plant looks very much like a junk heap.

There is a reason for all this perhaps; no doubt many reasons. Undoubtedly some men are happier dirty and slovenly than clean and picked up, but that is not generally the case. The real cause, I believe it will be found, is that this man has too darn much to do. He can't keep ahead of his work. Instead of his driving his work, his work is driving him.

## PLANNING DOES IT

This incubator cellar must be cleaned and the incubators put in order when the hatching season comes in the spring, and, of course, it takes this man longer to clean it then than it would have immediately after his hatching season was over. This cleaning usually takes a little longer than he figures, and consequently his hatches in general are a trifle late. He goes through the same thing with his brooder houses, but in order to get the right kind of green stuff on his ranges, it means planning and working ahead. Since usually he has not done this, he hurries in a makeshift green crop, such as oats or rye.

There you are: this man is always busy from daybreak until dark and still he never gets anywhere. He has only five or six hundred birds and he can't take care of these right. He is very much like the old horse who trots all day in the shade of one elm tree.

In direct contrast to this fellow, let's go over Longstreet's outfit. Here we see 2,500 birds all under two roofs. Here we see a man who figures every move that he makes in minutes and fractions of a minute; every time he moves he does something. He gets something accomplished. He does, of course, use factory methods, but where he does use them they are permissible. They are not in places that are harmful to the birds as we used to see on the so-called mushroom poultry farms which years ago came and went overnight.

## A SANITARY DRINKING DEVICE

Besides being an efficient worker, Longstreet has many arrangements which help out in his work. First off, he has a drinking fountain which is automatic, celan, sanitary and takes very little of his precious time. A four-inch terra-cotta pipe comes up through the floor, at the lower end of which he has a drain. This pipe extends about a foot and a half above the floor. Round this pipe he has a removable frame made of inch-square stuff for the birds to stand on when they drink. Coming up through the middle of this terra-cotta drain pipe he has a quarter-inch gas pipe coming to within about two inches of the top. This pipe is connected with a T-joint to a main flow at the bottom of the drain pipe. At the top of this quarter-inch pipe he has a small petcock with which he can regulate the flow. Over this petcock he has placed a gas reducer. This he puts on upside down so that it looks very much like a little cup three-fourths of an inch in diameter. The whole business comes up about even with the floor of the stand or the top of the terra-cotta pipe. Its advanetages are clear.

The water is allowed to flow just enough to flow over the top of this cup and it is kept running this way continuously. Once it is regulated, he has to spend very little time with his water system. Occasionally, once a week, he opens up the petcock a little and flushes the cup, regulates it again and then he is through cleaning for a week or ten days.

The idea of this drinking-fountain cup is that the birds have fresh running water all the time, since the water flows up to them and the cup is so small they do not put their whole heads in when they drink. Any water which they happen to contaminate with disease or dirt immediately flows over and out, and not only makes this drinking fountain sanitary but leaves no pan or vessel to clean and scrub. This is a cheap, absolutely clean and sanitary drinking device for the birds; above all it is a tremendous labor saver.

Another big help to this man is his overhead carrier, which goes the whole length of his hen house from the feed house. This, like everything else on Longstreet's poultry farm, is built with a view to economy as well as efficiency. This carrier is made from ordinary barn-door roller tracks which you see on most any farmer's barn door. The carrier is homemade also, simply being a platform two and a half feet wide and four feet long. On this carrier he has a hammer, a saw, a catching net, pencil, paper, an iodine bottle, nails, hooks, wire and so on. He saves himself a good many steps with these. For instance, if he sees a hook lost, he fixes it right then and there. If a bird is a little bit off he catches her right then and there. He has iodine ready for emergency, and experienced poultrymen will appreciate what all this means in efficiency as well as saving time.

On the other end of this track this man has a manure and litter carrier which makes his track a double server and which makes cleaning the droppings boards and house a great deal easier. Longstreet told me the other day that I had no idea of how much time he saved with this manure and litter carrier, but often having had the job of cleaning droppings boards and poultry houses, I can use my imagination very easily, especially when it comes to cleaning houses for almost 3,000 birds.

The fasteners on all the doors are home-made, cheap as well as efficient. Also, when this man wants a door to stay open, he does not have to lay down whatever he has in his hands to hook it or run around looking for string or wire to fasten it. He simply swings it a little harder than usual and it catches itself on a fastener of thin sheet metal which is bent S-shape. When he wishes to close the door again he does not have to unhook or untie this fastener. He simply pulls the door and this fastener releases the door and it swings shut.

Besides these and many other contrivances, all cheap and efficient, Longstreet is a great fellow to have everything arranged in apple-pie order. Everything is in a handy place. For instance, he has the feed bins right up near the carrier and carries his feed in and out with this carrier. His nests are all arranged at a handy place in the house so that he is not obliged to run all over the house to gather eggs. The broody coops are handy to the nests and thereby is another thing to cut down time and trouble.

## USES HIS HEAD

Not only has Longstreet put in all of these arrangements to save time, but he also uses them. Many nonsensical factory method arrangements are put in which sooner or later are abandoned. Not so with this man. Any time you go there, I do not care when, you will find these things operating and in good order. He has to use them and could not do the work he does if he did not. He is taking care of those 2,500 hens all alone and has time to spare. Of course, Longstreet is an exceptionally good worker, not only a hard worker but he makes every move count and he uses his head. The farm always looks picked up and in good shape, the houses clean and the birds doing well.

In order, it seems, to tax this man to his utmost, Fate willed it that he should be face to face a few winters ago with one of the worst, if not the very worst, and most virulent cases of chicken pox, roup and canker I have ever had the opportunity to see. I have seen quite some, especially in the past three years. Now some will say that had Longstreet been clean and tidy in his poultry houses and had he not had so many birds, he would not have had this trouble. I will admit that cleanliness and disinfection have something to do with such epidemics, but an infestation such as was on this farm is apt to come to the cleanest, and once there, it is going to be almost impossible to control, especially a case so virulent, unless a vaccine is found which will help.

Longstreet handled every bird of his 2,500 not less than once every ten days, and the whole of both poultry houses from floor to roof were thoroughly cleaned and sprayed as often. Now show me a man that is any more thorough than that. I mean a commercial poultryman, even with only 500 or 600 birds, and half a dozen helpers thrown in. There may be some, but I have never seen them.

## DEPENDS ON THE MAN

Without question, Longstreet has demonstrated during the past six years that the limit in size of a one-man poultry farm is in direct proportion to the size of the man. The size of a one-man poultry farm for some fellows is three or four hundred birds. For the Longstreet type it is not less than 2,500, and according to his calculation it may be as many thousand as it is hundred for some people. It is all in the man.

Some will question whether even a man like Longstreet would not make more a bird if he cut his flock in two or at least to a considerable extent. I hardly believe so, and Longstreet is convinced not, if one will figure the wholesale prices for feed, and especially the much smaller labor cost a bird with the larger number.

Without doubt the average one-man commercial egg farm is not 2,500 or 3,000 or even 500 or 600, but about 1,000 birds. A few years ago one could hardly afford to hire steady help on a one-man poultry farm, consequently the poultryman enlarged and cut his flock until he reached his natural limit as to capacity.

Today we see a different proposition. The many once-called one-man poultry farms are becoming one-and-a-half-men poultry farms. This has been made possible by the increased cost of everything and increased returns, also, from everything.

The one-and-a-half idea is, I believe, a good step ahead, as it gives the poultryman a chance to enlarge, keeping down the relative labor cost and quite a few overhead charges as well as giving him an opportunity to pull away more often for conventions, and so on. It gives him time off occasionly to do a little thinking and to visit, get acquainted with and learn from his colleagues and neighbors. This last is a most important point, for none of us know it all, and often new ideas are to be had simply for the trouble of observing the methods of others. So it pays to look round a bit. Then, too, there is the matter of getting to know the near by people better. That counts for a great deal in life. Longstreet has found a happy medium between drudgery and hard work.

## A 20-ACRE FARM

In many cases, our students may wish to own a twenty-acre place and carry 2,000 to 5,000 hens. Many of you have never been able to figure for yourselves just what you would be able to make on such a proposition or what such an equipment would cost.

It may rather surprise you that it takes some capital to start, and we advise those without to confine themselves to working on a poultry farm at a salary, or use the suburban plan in connection with some business where a regular wage can be drawn and the poultry kept as a side line. Keeping poultry on such a plan would enable you to get a fine training so that you could avoid many mistakes when you get on that dreamed of twenty-acre farm and begin work with confidence. Then you could save some of these items as an immediate outlay by rearing your own stock, and building many useful appliances to be used on such a farm. If possible you could select your land and begin the payment, and when you get it paid for you will be getting into shape where you could borrow when you wished to make the start if you did not have all of the cash needed.

Here is where the farm silo can be built, and in growing grain on your land you could save all of the straw for scratching material. The four cows that we put in this estimate will be valuable agents in making the farm a continual joy. They will not only furnish food for your own table, but the milk will be useful in rearing the young stock; in fact, you will have milk and butter fat to sell, and have ample sour milk to start off the young chick.

The horse is going to be necessary in keeping the land plowed for the crops and fresh for the chickens. We are taking it for granted that the sale of products from the farm in addition to the eggs which we give in the estimate and what is raised on the farm, would maintain the horse, and give in food value about fifty cents more than we show in the estimate which will be necessary to keep a hen a year.

All men who have studied the farm question agree that the great lack of co-operation among the farmers and their lack of ability to market their products prevent them from making the progress that they should.

The town or city man who finds his way back to the soil need not credit the farmers around him with absolute ignorance. You can learn many things from the successful farmer of experience. However, in the majority of cases they do not have the selling ability. A man who has lived in the city should know how farm products can be sold to the best advantage. Many of you who have an idea of starting the poultry work can make money for yourselves and increase prices for the surrounding farmers by handling the product of the farm on a commission basis. This will also allow you to make a contract with more assurance of keeping up with your trade than you could otherwise.

In doing this work it is better that you make all people who supply you with poultry and eggs agree to handle the same breed that you have and in most cases it would pay to start them with the same stock. You could sell them the baby chicks. The farmers could handle them with portable hovers or brooder stoves. You could market all of the broilers for them, and by teaching them good methods they would get eggs in the early fall and winter, which would enable you to handle large quantities of eggs, and by charging a reasonable commission you could make something for yourself and the farmer. They could secure more marketing their eggs through you than they could through the local merchants.

In starting such a work as this it is better to get the co-operation of only a few people at first and grow into the work. You would want only such men or women who would follow the directions and live up to their agreements. When they have the same stock as you are carrying you would have the advantage of advertising eggs for sitting purposes during the hatching season and be able always to have plenty of eggs for your machines and supply the demand for eggs for hatching. They could bring their own eggs to you and could make a reasonable charge for hatching them. It does not pay the farmer or the farmer's wife to hatch her chicks if she can get someone who is operating a Mammoth machine to hatch them for her. The poultry industry around you would grow. Your plant would become more valuable and it would be easier to keep up with a trade where you had a large amount of poultry and eggs than it would if you were the only one engaged in the work.

## CONFINING POULTRY TO HOUSES

A few years ago, a man by the name of Philo, in New York, wrote a small pamphlet and sold copies for a dollar each, and it is said that he cleared more than a hundred thousand dollars in one year off this little booklet. His system was to confine six chickens to a small coop, which measured 3 by 6 feet. However, the coop was so small that a person could not get inside of it in bad weather to look after the flock, and the endless detail, time and expense required in looking after so many small units made this system entirely impractical and unprofitable for the average man.

Charles Weeks, of California, set about to work out a plan that would get the same results as the Philo system, yet with most of the detail eliminated. The yard has no place in his system of poultry keeping, the ground being considered worth more for producing greens. He states that the less space a fowl can be kept on, and yet insure health, the less space there will be to disinfect and keep free from disease germs. The sections of his house are built 8 feet square and the house can be built as long as desired. There is a three-foot projection over the open front to keep out rain. Twenty hens are kept in each one of these pens.

If you wish to grow green food on a city lot and cannot grow it in any other way, you can make a frame of six or eight inch boards, and cover this with poultry netting as shown in the above illustration. This frame can be lifted and the soil underneath spaded and sown to wheat, rape, Swiss chard, or some other kind of tender green food. As the leaves grow and reach the wire, the fowls can get the benefit of same by ating through the wire. This prevents the fowls from destroying the roots of the plants so that they continue to grow and furnish an abundance of green food.

These pens are eight feet square, five feet high behind and seven and one-half feet high at the comb, open front to the east, over which is a three-foot projection to keep out rain and under which the attendant walks to care for fowls. These pens are built side by side into long houses, there being no limit to the length. Between each two pens is the feed hopper built into the partition and feeding both sides, holding one sack of dry mash and one of mixed grains in its respective compartments. Full length along the outside is the green feed trough from which the hens eat through the opening. The water buckets are also on the outside. Thus all the hens are fed greens and watered without opening a single gate or door. The hoppers inside are filled once in about two weeks. The dropping boards and ground floor are cleaned once per week by simply raking the filth from the top of the sand which covers the floors.

Twenty hens, well bred, well fed, and quarters kept sanitary in this little pen, are good for at least $2 per year net profit above all expenses. These twenty hens have nice, sharp sand upon the floor and roosting boards, which is raked clean regularly; they have dry mash and mixed grain by them continually; they can stick their heads through to the green trough outside and eat green feed every hour during the day; they drink water from the clean galvanized buckets on the outside; they dust in the sand; they jump up to the feed hopper; they jump down again to the green feed trough; they run to the water; they hop up to egg boxes (which, by the way, is the most important move of the day) and after depositing their board bill and rent plus the extra profit, they jump down and up again to the perches for an afternoon rest, or stretch out into the afternoon sunshine which comes in through the western window. A hen always active and busy is bound to be a profitable one.

## CO-OPERATION WILL BRING RESULTS

If the small or intensive poultrymen would organize and co-operate in small communities, it would be an easy matter for most of them to make their poultry very profitable. They should co-operate in hatching their chicks in one big central hatchery. They should co-operate in marketing, co-operate in exchanging questions of knowledge and experience concerning poultry production.

Instead of each poultryman having to spend his time in finding customers for his products, and losing his time in delivering the same, all that he is able to produce should be handled through an agency by one salesman, and should be collected and sold from one auto truck. This prevents price cutting, and establishes stability in the business and confidence in the producers. The consumers will have one place to which they can look; the business will be done in a systematical way, thus accommodating the consumer as well as the producer.

One of the advantages of this co-operation, and by locating in a community of thickly settled poultry raisers, is that the buying of feeds in large quantities direct from farmers, wholesalers or manufacturers, would permit doing it at a reduced price. The poultrymen of each community should own their own warehouse. The feeds could be delivered direct to the poultrymen at cost. Any necessary grinding and mixing of feeds could be done for the whole community. The feeds could be bought during the dull seasons, and obtained at the lowest price. If necessary, this method would permit the poultrymen to be able to mix their own feeds, and thus avoid the danger of adulterations, or mouldy materials.

One of the great advantages of co-operating in communities like this, is the fact that poultrymen can come together and exchange experiences and views on different matters, each man thus coming in contact with the best methods obtainable for his particular climate and soil. Poultrymen could meet in these club houses, or community houses, and discuss their problems and accomplishments. Much inspiration is received in this way that would tend to lead to even greater success. Friendly rivalry would spring up, and much good would result.

## PRACTICAL POINTERS

Keep the hens confined to your own land.

Do not keep a male bird. Hens lay just as well without a male.

Do not overstock your land.

Purchase well matured pullets rather than hens.

Do not expect great success in hatching and raising chicks unless you have had some experience and have a grass plot which is separated from the yard for the hens.

Build a cheap house or shelter.

Make the house dry and free from drafts, but allow for ventilation.

Fowls stand cold better than dampness

Keep house and yard clean.

Provide roosts and dropping boards.

Provide a nest for each four or five hens.

Grow some green crop in the yard.

Spade up the yard frequently.

Feed table scraps and kitchen waste. Feed grain once a day.

Feed a dry mash.

Keep hens free from lice and the house free from mites.

Kill and eat the hens in the fall, as they begin to molt and cease to lay.

Preserve the surplus eggs produced during the spring and summer for use during the fall and winter when eggs are scarce and high in price.

## LESSON 20—QUESTIONS ON INTENSIVE POULTRY CULTURE

1. Has there ever been a time when some farmers should move to town?
2. On what three factors does success depend?
3. Can you judge the fertility of the soil by any one farm?
4. Why is it necessary to utilize the land on some kind of feed crops?
5. Are the droppings an important item in poultry work?
6. In what way does the cropping of land help?
7. Is there any difference in condition in the Eastern specialized poultry centers and poultry farming in the grain belt?
8. How much wheat will a dozen eggs buy in states of three different sections of the U. S. at the average prevailing price?
9. Would a soil map be of any value to a prospective farmer?
10. Is it always the farmer's fault when money is not made?
11. Name the advantage of poultry farming that each section has.
12. Can you make a living from poultry by guessing your way?
13. Can you succeed with all borrowed capital?
14. What is the minimum capital to begin a 5-acre farm?
16. In city lot farming would you rear or buy your stock?
17. How should stock for city lot farming be secured?
18. Name a cheap way for a city man to procure feed to force fowls for egg production.
19. Name a cheap method of carrying a large number of hens in a city for forcing for eggs.
20. What are the factors that favor the small grower?

## LESSON 21—QUESTIONS ON INTENSIVE POULTRY CULTURE

1. What are the advantages of the suburban dweller in poultry keeping?
2. How would the suburbanite poultry farmer get his start?
3. When should the male bird be disposed of?
4. How many hens can be kept on a one-man poultry farm?
5. What is regarded as conservative units for poultry farming?
6. Is it better to purchase a run-down poultry farm to make your start?
7. About how much time each day does it take to handle 500 hens properly housed?
8. What is the best green food to grow for winter use?
9. How many birds does the Mixa plan suggest to begin with?
10. Describe the interior arrangement of the houses of the Mixa plan.
11. Discuss the percentage of egg production that 235 pullets should produce when hatched at the period suggested in the Mixa plan?
12. What income can be reasonably excepted in a second year's work provided good judgment is used?
13. What is your administration building on an intensive poultry farm?
14. What are the parts to the unit of production?
15. Describe the breeding pens for the 1-acre farm.
16. Why should the residence of the 10-acre farm face the East?
17. What are the important side lines of the ten-acre farm?
18. How far does the owner travel in making the rounds of the 10-acre farm?
19. What are the objectionable features of the 10-acre farm?
20. Is a 10-acre farm the best size for all sections of the United States?

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# Poultry Farm Management and the Use of Artificial Light to Increase Winter Egg Production

By T. E. QUISENBERRY

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## CHAPTER I

### IS POULTRY KEEPING A GAME OR A BUSINESS?

We are accustomed to being taunted with the fact that many poultry people who embark in the poultry business fail. We admit that there are a large number who do not make good, but consider the large number of failures in other lines of work. It is estimated that 80 per cent of all business men are prosperous and laying up money at forty-five; at the age of sixty-five there are only 3 per cent that are succeeding and not dependent on some one else. About ninety-seven out of every hundred are dependent upon others for their support.

Those who say that you cannot succeed at the poultry business should weigh well these figures. The man who starts into the poultry work and does so on such a scale that his losses will not be too great the first two or three years, while he is gaining knowledge, has just as good a chance as the average business man and, we think, considerable better. Once he gets started on the upward grade, well launched into his work, with a growing prestige, he will not be dependent upon his relatives at sixty-five, but will be engaged in a work of growing interest that will afford him as much pleasure at sixty-five as it did at thirty-five.

President Pritchett, of the Massachusetts Institute of Technology, is authority for the statement that the average income of graduates of that institution is $650. Do you not believe that a man who has a thorough training in the poultry business can earn a better salary than this in the work?

Most farm incomes look small when the actual figures are given, but investigators tell us that the income the farmer's family has to live on is greater than the average income of the average family that lives in the cities and towns.

The poultry farm is constantly increasing in value if the poultryman knows his work. He is breeding each year a better strain of birds. His time not needed in caring for the stock is used in making improvements that add value to the farm each year and as he grows old he has something laid away.

"Can a man make a living from poultry?" "Isn't chicken raising a losing game?" These and similar questions are asked by business men and prospective poultrymen in all parts of America.

In the first place, we dislike to hear the business of poultry raising called a "game." It is a business, a big business, in every sense of the word, and statistics compiled by the Department of Agriculture leave no doubt about the important position which poultry products occupy in the commerce of our nation. The industry is growing by leaps and bounds. It is not a "game" any more than any other business or branch of agriculture is a game. There are many failures, and an element of chance in all lines of business. There are many failures in the poultry business, there always will be, but there is always a reason. Some are avoidable and others unavoidable. It is usually the faul of the man or the conditions and not the fault of the business itself.

There are two or three districts in California, and the same is true in many other states, where hundreds of people are making a living exclusively from the production of poultry and eggs. Especially is this true of the Petaluma and Hayward, California, districts. There are men and women who have only two to five acres of land on which they keep from 1,000 to 3,000 hens. Many of these people have bought and gradually improved their land, built comfortable homes, and accumulated some surplus cash, absolutely and solely from the sale of poultry and eggs. They devote all their time to their poultry, and they purchase all their feed.

In the Hayward, California, district, they organized a poultry producers' association, a co-operative organization. They built one warehouse in which and through which to transact their business. They buy their feed and supplies in carload lots. By purchasing fencing material, incubators, equipment, baby chicks, feed and other supplies in large quantities they can save freight and express and obtain the lowest possible prices. By selling their products co-operatively through their manager, they are able to furnish a uniform product of high grade and command the best prices. So successful has been their venture that the Hayward Producers' Association has just erected another very large warehouse. The organization seems to be very thrifty and beneficial to its members. It has a membership of some 200 to 300, we understand.

The fact that two or three thousand hens can be kept on from two to five acres, and that all the feed can be purchased and a family make a living from hens kept in this way is contrary to all teaching. We would not recommend for all sections such intensive methods as this. Conditions, soils, climate and markets vary and the successful poultryman is one who has gumption or common sense enough to vary his methods to suit varying conditions. We simply mention these facts, not for the purpose of urging others to attempt to raise poultry on such intensive methods, but to show that poultry and eggs can be produced at a profit and that the business is profitable, if sensibly handled, even under conditions which are not generally regarded as the best.

One of the biggest mistakes made on the average American farm is that labor is not properly distributed through the year. Too much of the farm work must be done in a short period. One of the chief objections to men taking up work on the farm is that the farmer so often wants him only during the farming months and the laborer must remain idle during the winter or seek work in the city, and when he once gets located he hardly feels like going back to the farm for merely temporary employment.

The poultry work fits well into a diversified farm plan. Right at the time of the year when the farmer needs revenue and when farms fail to show any returns at all, the money from eggs would be considerable. It is true that the young chicks, when hatched by hens, interfere to some extent with the spring work. If machines are used and the hatch brought off in February and March, before the rush of the farm work comes on, and the chicks are well started to growing, it will be very easy to handle them without interfering with the general farm work. In this work the male birds should be sold at broiler age and very few male birds carried over until fall. It would take very little time to handle five hundred layers during the winter season, and it would not be a very big job to raise as many as three hundred pullets each year to replace those culled out. Even if you cannot raise quite all the stock, some eggs might be farmed out to neighbors to help raise stock, or eggs can be sold to neighbors and you can have an agreement to buy a certain number of pullets from them.

By using artificial methods of brooding and having a large size machine the early chicks can be out of the way by the time the rush season comes on.

The greatest returns on the investment are made, to a large extent, by those who are not giving their entire time to the poultry work, but are using the fowls in a well planned farm scheme.

There are many opportunities in the poultry work to which we would like to call your attention. The biggest opportunity is in owning your own farm. Business has tended toward specialization and the opportunities for making money with small capital, when it is necessary for you to compete with business which has large backing, grows poorer each year. At one time the shoemaker made the whole boot or shoe. Today the shoemaking business is one of the specialties. One man guides a machine that makes the soles, another guides a machine that makes the pegs, another makes the hooks, etc. There is little opportunity for a man to rise in such occupations. It is a humdrum work with enough salary to keep things going as long as health and the job lasts.

Three or four thousand dollars will not start you in much of a business, but that much money, or less, well invested in a poultry farm equipment will make a living for a family, providing one is fitted for the work and has the love for it.

As the years pass, your opportunities in the class of work that we have just mentioned do not grow better, as a rule, but such men realize that they are gradually approaching the day when the pace slackens and that they will have to make way for younger men. It is different with a well managed pouutry farm. The plant is enhancing in value each year. The owner is getting better fitted each year to run the business, his reputation should be growing and the financial returns should be on the gradual increase each season.

If he is building a good strain of fowls, and keeping the right kind of records, he is constantly growing in prestige and placing the business on a surer footing.

We would not deceive you by leading you to think that you can start with a hundred or so dollars and make money out of poultry. You will need some capital to buy land and equip it.

## HIRING OUT

Many times it would be more profitable, if you love the poultry work, for you to hire out to manage a farm, or to go and work on some good poultry farm and get free training and experience and at the same time earn a salary. There are many opportunities along this line, especially if you will get a little experience. In this way you have a chance to study errors at the other fellow's expense, and can then make a start for yourself with much surer chances of success than you could without this experience. It is certainly unwise to invest money in a poultry plant without first obtaining some experience. No person who has managed to save a little nest egg can afford to lose it, and the chances are against you unless you have had some actual experience in handling birds.

The demand for good poultrymen has never been supplied. There is not one good poultryman in a thousand. Often-times a good position that will pay a fairly good salary can be obtained if the owner, manager, or the head of the department knows that you are actually interested and want to make good in the work. They would always prefer to employ some one who has ability and who will take an ambitious interest in the work with a view to putting what they have learned into practice.

Many men are being used to do extension teaching. If you will master the work that you have had, get the practical experience, and have any talent for public speaking, there is a fine possibility in this field. This does not mean to be an eloquent speaker, but you must be able to handle the English language well and talk interestingly and knowingly. It does not take an oratorical style to interest people.

The field of poultry journalism does not offer much chance for large financial returns, as many seem to think. Your chief advantage in this work if you are in any form of extension or teaching work, is to get an acquaintance that will help you, and, if you have stock or eggs for sale, to get a prestige that gives your stuff better selling values.

Poultry judging is one of the best fields in connection with poultry farming. Much outside money can be made in halding shows. This comes at a season when things are slack and when you can well get away from your plant. This requires practice, but it brings you in contact with many poultrymen and affords you many opportunities that are worth much to you.

One of the great advantages of any line of farm work is that if you have children, it affords you such a good chance to train them in habits of thrift and affords you an opportunity of companionship with them not to be had in any line of work in city or town. Many of our best men are reared on the farm and do not have the temptations thrown around them that would be encountered in cities. The chances for success are enhanced by rearing the boy or girl in the country, provided opportunities for schooling are offered.

## SCIENTIFIC MANAGEMENT

A new slogan is ringing nthrough the business world—"Scientific Management!" What is it?

Dr. Frederick W. Taylor, the originator of the system, says that it means knowing just what you want done, and then doing it, in the best and the cheapest way. Theodore Roosevelt said that Scientific Management is the application of the conservation principle to production. Some one else says that the basis of Scientific Management is "the rigorous cutting away of superfluities—not one wasted motion, not one wasted minute."

As applied to shop management, it means the mastering of all the available knowledge concerning the work to be done. This knowledge is to be used in the most effective way possible in the doing of the work. It means also increasing this knowledge to the farthest degree possible by investigation and experiment.

Scientific Management as studied and practiced now in the great productive industries gets down to the smallest details—the motions of the workmen, division of labor, "task" study—that is, the study of the amount of time requpired to do a certain piece of work of prescribed quality—the standardization of methods and tools and devices—that is, the classification of these things according to their scientifically established utility. This new system of management neglects nothing as trivial, but searches relentlessly for the greatest possible efficiency in every detail of the business.

Why should not the principles of this system be applied to this great modern productive business of poultry culture? The supreme need in the average poultry plant today is "the rigorous cutting away of superfluities—not one wasted motion, not one wasted minute." Just this is Scientific Management.

Now for its application on the poultry plant.

## HUMAN EFFICIENCY

A few years ago the man who cared for 500 fowls was accounted a fully employed man. The rule was that not more than 15 fowls should be kept in a pen during the winter season, and that the pen should be at least 12 feet square. This made at least 33 pens of fowls, besides the many other necessary pens and cages for the accommodation of sick fowls, broody hens, unused roosters, etc. Today the claim is made that one man should attend successfully to at least 2,000 hens.

It is thus evident that poultrymen have been studying "Scientific Management," though they have not called it by that name.

Some time ago I visited a great poultry plant in Missouri where one small salaried workman has the exclusive care of 3,500 laying hens, except the gathering of eggs. These hens were kept in seven different houses, 500 in each house. Compare such a system to the most highly developed "systems" 20 years ago! This will suggest what progress has been made in Scientific Management among poultrymen. It will also suggest what progress is yet possible to be made; for, as our fathers were fooled in thinking they had spoken the last word in poultry culture, so we are greatly fooled if we think we have spoken the last word.

Speed is one of the big things in the doing of work. Scientific Management makes "Time Study" its great fundamental principle. Under this head "Motion Study" comes in for a very prominent place. This is the science of avoiding all waste of time in the motions men have to make in the performance of work. Since time is cash to every successful poultryman, the importance of this can be seen at a glance.

What an immense field in the average poultry plant for the study of this subject of speed! How to feed several thousand fowls with the greatest possible speel—how to water them in the least possible number of minutes—how to gather their eggs with the fewest possible motions—how to care properly for several thousand young chicks with the fewest possible movements of hands and body—and so on without end—these are the questions that must be answered to a scientific certainty before the poultry business can take its place where it belongs. The man who cares for hens by hundreds or thousands needs to become "fingerwise" as well as the man who plays the piano.

### THE ESSENTIALS REQUIRED IN A POULTRY FARMER.

The poultryman must be a combination of a business man, mechanic, naturalist, laborer as well as a poultryman. He must have executive ability sufficient to organize his poultry farm into a successful business enterprise. The idle horse in the barn, an unproductive piece of ground or the barren fruit tree or vine is often a more frequent source of loss to the poultryman than the original cost of the thing itself. Many poultrymen fail because of poor farm management. He must have some knowledge about animal feeding and breeding, crop growth and horticulture. The majority of successful poultry farmers do not depend entirely upon hired help, but they do much of the more important manual work themselves.

A successful banker would not expect to mount a locomotive and become a successful engineer without some experience in that line of work, yet many men feel that if they have made a success of some business in the city they could make their profit at poultry farming at once, even though they are absolutely lacking in experience. Other men who have failed in everything else take up poultry work and expect to succeed with that, even though they have no knowledge of the business. There is possibly no occupation in which experience is not necessary. Poultry raising calls for experience with diseases, weather conditions, insects, plant feeding, breeding, animal feeding, business affairs, machinery and many other things that it requires them to learn. If you begin without experience you should put your theories into cold storage and follow the practice of other successful poultrymen as closely as possible for the first few years. Even then you can expect to make many mistakes.

### TYPES OF POULTRY FARMING.

Types of poultry farming may be divided in many different ways. There is the commercial egg farmer, the side line poultry work on a general farm, the broiler, roaster and capon business, the baby chick industry, the sale of hatching eggs and breeding stock. While many succeed in a single branch which has been mentioned, yet the wisest and most successful poultrymen, as a rule, are those who combine two or more of the above types of farming. There is a greater chance of success where this is done. If you fail in one line you may succeed in another.

### FIRST SECURE A KNOWLEDGE OF POULTRY.

The young man who proposes to start poultry farming should first get some knowledge of the business or get some experience. Poultry education is much more essential in poultry farming than in most any other type of farming and more so than it was twenty-five years ago. It is going to be more essential in the future than it has been in the past or is at present. I nsome counties the farmers who have attended high school make almost twice as much as those who have never been beyond the district school. In 90 per cent of the cases you will find the poultrymen who are making the most are those who have made some study of the poultry business, through a poultry course similar to this, or who have gained some experience in some other manner. In New York a survey was made of 573 farms, with reference to the education of the farmers, and the following results were found:

Relation of Education to Labor Income in 537 Farms—

| Education | Number of Farmers | Labor Income |
|---|---|---|
| Attended district school........................ | 398 | $318 |
| Attended high school........................... | 165 | 622 |
| More than high school.......................... | 10 | 847 |

New York, Cornell Bulletin 295, p. 552.

## THE FARM LAYOUT

It is very often better to buy a piece of land unimproved, rather than to select a place with a lot of old buildings which are practically useless and which have been arranged so that two or three times as much labor is required as is actually necessary. The arrangement of the greater portion of all farms at present is the result of accident. The new and old buildings found on same are more or less patched up and are really a collection of unrelated buildings. When you select a farm, improved or unimproved, you should make a more or less definite plan for the development of your place, so that new fences, new buildings, and other changes can be worked gradually toward one definite plan. The fields, brooder houses, laying and breeding houses, should be arranged so that they can be worked from one central point. You can figure the approximate time lost in going to and from distant yards and determine the amount really lost because the right layout had not been planned.

## AN ATTRACTIVE FARM YARD AND LAWN.

There is no necessity for any poultryman having a lot of bare and unsightly yards and buildings. One of the first essentials for an attractive poultry farm is neatness. A little attention to the planting of shrubs, fruits and trees will accomplish a lot. Pattern after other attractive homes and farmyards in your community and in nearby towns. A little study and practically no labor or a great deal of added cost, will add to the pleasure and pride which you get as a result of your poultry farm arrangement.

The poultry and farm buildings should be in keeping with the farm.

It is a mistake to put the greater portion of your capital into a residence and have but little left to put into poultry houses and equipment, and into stock to produce more poultry and eggs. Ordinarily not more than ten or twenty per cent of the capital should be invested in the farm home.

The cost of your poultry buildings should not exceed $2.00 per hen; it should be limited to as much less than that as possible. The main thing is to look after the comfort and health of your birds. Even more important than the capital invested in the buildings, is the arrangement for saving labor. Poultry buildings and farm buildings are put up at different times and usually without any definite plan.

## COMPARISON OF INTENSIVE AND EXTENSIVE FARMING

Whether chickens, fruit or vegetables or some other intensive product will pay better than corn, wheat, cotton or cows, is largely a matter of adaptation to conditions. There are conditions and sections where apples pay better than corn, and there are other conditions under which corn will pay better than apples. Each type of farming must be conducted where it belongs and if that is done poultry farming, combined with some other profitable side line, will pay as well in proportion to the amount invested, as most other lines of agricultural work. If some one crop or branch of farming paid abnormal profits there would soon be a rush of people engaging in that industry, and it would soon pass to the bottom of the list, because of over-production.

As far as the relative investment is concerned, many small fruit and poultry farms require more capital than the other farms with large acreage. They may have less capital in lands, but more in other things. The size of the farm or the amount of capital invested is no indication of the success of the enterprise. The success depends upon efficiency of the manager and adaptability of the land to the proposition for which it is being used.

## RELATION OF SIZE OF FARM TO ECONOMY IN BUYING AND SELLING

There is a great saving in buying building material, fences, equipment, feed and other necessities on the poultry farm if they can be bought in car load lots, or larger quantities. There is also a great gain if the poultry, eggs, vegetables and fruit products can be shipped in large quantities. Therefore, if poultrymen would co-operate in buying and selling it would be greatly to their advantage. By doing this the owner of three to five acres can make as much profit for the amount invested and the time spent as the man who owns a much larger place. It takes much less intelligence to direct a hired man, so as to make a profit from employing him, if he cares for 2,000 hens, than it does if he only cares for 1,000. It takes much less intelligence to make a profit out of an incubator which hatches 5,000 chicks in a year, than it does out of the same size machine that hatches only 1,000 chicks in a year. It takes less ability to make a profit out of 4,000 hens kept on forty acres of ground, than it does to make a profit out of 1,000 hens kept on five acres.

Whatever the size of the farm, it should be large enough to allow for the use of well established labor saving devices and practices, and provide sufficient labor to make a full year's work.

## USE PURE-BRED POULTRY

If any considerable number of chickens are kept they should be Standard-bred. Poultry multiplies rapidly and the cost of getting started with standard-bred poultry, compared with mongrels, is very small. Even though there are only a few hens kept in a back yard, we recommend pure-bred stock.

Fifty White Leghorn pullets competed in a year's test with fifty mixed common pullets, at the West Virginia Experiment Station. The mongrels ate more feed and laid an average of twenty-one eggs per pullet less than the White Leghorns. The mongrels gained more in weight than the Leghorns, but after considering the feed consumed, their meat and eggs produced, the Leghorns gave forty cents more returns per hen than the mongrels.. In other tests which have been made, the difference is even more striking than this in favor of Standard-bred poultry.

## THE NUMBER OF HENS TO KEEP

There was an average of fifty chickens for each farm keeping chickens and a little over four turkeys on the farms that kept turkeys in 1908, as shown by the census of 1910. A small number of fowls like this can pick up the greater portion of their living around the farm at practically no cost to the owner. The greater portion of eggs produced come from farm flocks. If you are to keep a large number of fowls and have to purchase practically all of your grain, or to feed grain grown upon your own farm, you must understand the poultry business, have a good market, and be skillful in handling your birds, or you cannot compete with the small farm flocks which dominate the general market. By producing a good product and educating the public to the food value of eggs, so that they will pay a better price for same, it is possible for any poultryman to do at least reasonably well in the poultry business.

Not only are the chickens and eggs upon the general farm produced very largely from waste products, but the time spent on poultry, to a large extent, is the care given by women and children. This reduces the labor cost to the minimum.

## AMOUNT AND VALUE OF HEN MANURE PRODUCED

Manure Produced per 1,000 Pounds of Live Weight:

| | Excrement per Year | Manure with Bedding per year | Nitrogen per Year | Phosphoric Acid per Year | Potash per Year | Approximate Cost if Purchased in Fertilizers[1] |
|---|---|---|---|---|---|---|
| | Tons | Tons | Pounds | Pounds | Pounds | |
| Horse. ........ | 8.9 | 12.1 | 153 | 81 | 150 | $33.72 |
| Cow. . . .......... | 13.5 | 14.6 | 137 | 92 | 140 | 31.20 |
| Sheep. ........ | 6.2 | 9.6 | 175 | 88 | 133 | 36.84 |
| Calf. . . .......... | 12.4 | 14.8 | 150 | 105 | 102 | 32.28 |
| Pig. . . .......... | 15.3 | 18.2 | 331 | 158 | 130 | 64.48 |
| Fowls. . . ........ | 4.3 | ....... | 293 | 119 | 72 | 54.52 |

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[1] The nitrogen is figured at 16 cents and the other constituents at 4 cents per pound.

Hens eat over twice as much in proportion to their weight as cattle and return twice as much value in manure. Poultry manure is very dry and concentrated. The value of manure depends on how much it is needed and for what fertilizers can be bought.

One of the best places to store manure is in a covered shed or in a manure box, such as is illustrated in our lesson on Poultry Appliances. If there is a cement floor in the manure shed it can be preserved with little loss. Hen manure loses by heat, but if mixed with soil or other manure the loss is less.

## THE ADVANTAGE OF A CLOSE MARKET

On account of the difficulty in getting eggs to the consumer quickly and in good condition, the poultryman who is nearest a good market has a decided advantage. A dozen eggs in New York will buy sixteen pounds of wheat, but will buy only thirteen pounds in Iowa. A dozen eggs in Iowa will buy twenty-three pounds of corn and twenty-one pounds in New York, twenty-four pounds in Massachusetts, fourteen pounds in South Carolina and fourteen pounds in Mississippi. About the same ration exists as to poultry. The ratio may be changed with better methods of handling eggs and poultry, but at present prices of grain and poultry products, there seems to be no question about hens paying better in the North than in the South. Professor Warren of Cornell University, states: "If we assume that a hen lays eight dozen eggs and that there is five pounds of poultry sold for every hen kept, we would have the following comparisons:

| | Massachusetts | Iowa | South Carolina | Mississippi |
|---|---|---|---|---|
| 8 dozen eggs | 2.72 | 1.52 | 1.68 | 1.52 |
| 5 lbs. meat | .84 | .48 | .58 | .58 |
| Total | 3.56 | 2.00 | 2.26 | 2.10 |

"The difference between Iowa and Massachusetts is enough to pay the entire feed bill for a hen a year. In South Carolina, corn costs more than in Massachusetts. The average egg production per hen is about half as much as in Massachusetts. Diseases are also worse in the South. Poultry in the South gathers more of its own food, because of the long season for green food, and because of the abundance of insects. The cost for housing is also less, but the cost of housing in the North should not be over ten to twenty cents per hen per year. After allowing for all these differences, there is no question but that the profit is better in the North. The South will always raise poultry for local use, as will every other country. Such a farm should be located nearer large markets, or might be located in the region of cheap food, if the lower prices could be overcome by care and prompt shipment."

## TRANSPORTATION AND EGG PRODUCTION

Average price received by farmers for eggs and poultry (1910 and 1911):

| | EGGS | | CHICKENS | |
|---|---|---|---|---|
| | Average Farm Price | Per cent of the Iowa Price | Average Farm Price | Per cent of the Iowa Price |
| Colorado | 26 | 137 | 13.4 | 140 |
| Nebraska | 18 | 95 | 9.1 | 95 |
| Iowa | 19 | 100 | 9.6 | 100 |
| Illinois | 20 | 105 | 10.9 | 114 |
| Indiana | 21 | 111 | 10.8 | 113 |
| Ohio | 22 | 116 | 11.3 | 118 |
| New York | 27 | 142 | 14.4 | 150 |
| Massachusetts | 34 | 179 | 16.8 | 175 |

**Egg routes should be established.** The average poultryman cannot afford to waste hours of his time in going to town to market a few dozen eggs or a few chickens. If he figures his time against the price received for the eggs, a small quantity taken to market at one time often makes the cost very high and the price received very low when you take the net amount into consideration. For these reasons the poultrymen and general farmers could establish egg circles or egg routes and have a light truck make a trip over the route two or three times per week, if not daily, and collect up eggs and poultry which the farmers had to market. If eggs are held any length of time the quality depreciates, which results in low prices; and this condition will continue until some system of frequent delivery is started. We feel that the government could well afford to change or modify the parcel post law so as to permit rural mail carriers to carry cases of eggs and charge a fee for them.

### THE VARIATIONS IN RELATIVE VALUES OF EGGS AND FEED PRICES

While the value of wheat, corn and poultry feeds have advanced in price, yet eggs have made a relatively greater advance. In other words, it takes fewer dozens of eggs today to buy a bushel of wheat in most markets than it did a few years ago. As the population increases we must expect to see eggs and poultry advance in price relative to feed costs. The hen is a much more efficient user of food than other animals, and, therefore, we can expect an even greater increase in the net profits of poultry and eggs in the future than from other meat products. The poultryman can better afford to pay present prices for feed and receive in return a greatly advanced price for his eggs and poultry than he can to have feed sold to him at a lower cost, and he be forced to sell his eggs at losing prices, as was done in former years. The margin of profit on all animals is constantly becoming closer and this necessitates us giving more attention to better feeding and better stock.

### CERTAIN MARKETS DEMAND SPECIAL PRODUCTS

The New York, Philadelphia and San Francisco markets will pay from 3c to 15c per dozen more for white eggs than they will for brown, even though the quality be the same. In Boston and other markets brown eggs bring a relatively higher price than whites. Certain other markets demand a certain size or type of chickens and will pay an extra price for same. For these reasons the poultry farmer must study his market and if he ships eggs to New York he must keep White Leghorn hens, or some variety which produces white eggs. The fact that Pacific Coast cities pay a premium for white eggs, is the reason that White Leghorns are in the great majority. If you are forced to keep a non-sitting variety you will be compelled to sell your surplus cockerels as broilers and you will have to provide yourself with means of raising your chickens with incubators and brooders. All of these facts should be taken into consideration when planning your farm and in managing same.

### THE VALUE OF COMMUNITY EXPERIENCE AND CO-OPERATION

When a poultryman locates in a community where a certain variety of poultry is being bred extensively, he often feels that it is necessary for him to breed some variety entirely different from that which prevails in that section. This is a mistake. It is usually best to have each community confine itself largely to one variety of poultry. When this is done, the size, shape and quality of the eggs and poultry that go upon the market from that particular section, is more or less uniform. They eventually build up a reputation for a uniform product that is more or less in demand.

As a rule, it is best to engage in the same type of farming as the community. In that way you can profit by the experience of others, and this is of great value to any one engaged in poultry raising. You owe more to your neighbors than you realize. It is all right to try out new ideas, different methods, different kinds of building construction and various ways of saving labor, but it is a good idea to follow up methods which have proven successful with poultrymen of your own community.

## ADVERTISING VALUE OF A NEIGHBORHOOD

If you were going to purchase Holstein cattle you would probably go to Wisconsin, for the reason that that state is noted for its dairy herds. If you were going to purchase Hereford cattle you would probably visit Kansas City territory, for the reason that a large part of the great Hereford breeders are located there. If you expected to go into the raisin business, you would probably go to Fresno, California, for the reason that it has been advertised as a successful raisin plum district. Just so with poultry raising. If you wanted to purchase 1,000 bred-to-lay pullets of a certain type, you would prefer to buy them in a community where the poultry raisers had been giving particular attention to this sort of thing for years previous, and where they had a reputation for that class of work. Pure-bred pullets and live stock sell for most in regions where the breed is best developed. Manufacturers realize the advertising value of a community so that they have developed shoe centers, furniture centers and clothing centers. Buyers are attracted to such centers and skilled labor is easier to secure. Poultrymen should bind themselves together as much as possible in a co-operative community and produce and build up a reputation for uniform products which command higher market prices.

## DISTRIBUTION OF LABOR ON POULTRY

"The monthly distribution of labor in raising and caring for hens and marketing eggs, is shown in figure 39. It includes all the time involved in keeping a flock of 500 and raising about 1,200 chickens, or about 600 pullets. The flock was kept on a 318-acre diversified farm. The hens were in one large house. A feed bin in the house was filled from a wagon; the house was cleaned by driving through with a manure spreader. The chickens were raised in three lots by two incubators. The buildings and other arrangements were such as to facilitate labor. It will be seen at once that it would require many hens to keep one person busy, as the care of this flock only requires about two hours a day, except during the incubating season, when it requires about six hours a day. This is a very unequal distribution of labor. The largest amount of work with poultry is in raising chickens. This comes at the same time as the largest amount of work with hens and preparing eggs for market. 'Seed time and harvest' come at the same time with poultry. This work interferes seriously with the spring work on a farm. It fits best on farms that have the highest pressure of work at some other season. It fits better with hay and winter wheat than with larger areas of spring-planted crops. Frequently, much of the poultry work is done by women so that it does not interfere with farm work."

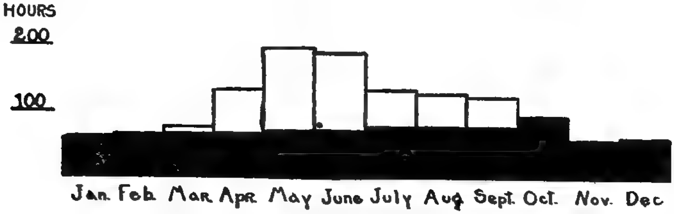

Fig. 39. Black is distribution of man labor in caring for 500 hens. White is distribution of labor in raising 1,200 chickens.

## KEEPING FARM ACCOUNTS

It is an easily noticeable fact that the city business man who keeps very poor account, if any, of his own business, more often leads to his failure than any other business short-coming. We feel that many failures on poultry farms can be attributed to the same cause. The poultryman who keeps records, pays closer attention to the detail of his business than the one who does not. This practice always leads to improvement and to a more profitable business.

Breed W Wyandotte Hatched Apr 28/19

## MONTHLY RECORD SHEET

Month of Dec. 1919 No of Hens in Pen 11

Pen No. Male No Male No. Market Price of Eggs per doz. $1 00 No. Laying 11 No Not Laying 0

| Band No of Hen | DESCRIPTION | *Color of Egg | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | Total for Month | Total since | Date of First Egg | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | | X | | X | X | X | | X | X | X | X | X | X | X | | X | X | X | X | X | | X | X | X | | X | X | X | X | | X | X | 25 | 44 | Nov 4/19 | |
| 2 | | | X | | X | X | X | X | | X | X | X | | X | X | X | | X | X | X | X | | X | X | X | | X | X | X | X | | X | | 23 | 29 | Nov 23/19 | |
| 3 | | | X | X | | X | X | X | | | Broody | | | | | | | | | X | X | X | X | X | X | X | | X | X | X | X | X | X | 18 | 38 | Nov 7/19 | |
| 4 | | | X | | X | X | X | X | | X | X | X | | X | X | X | X | X | | X | X | X | X | X | X | | X | X | X | X | | X | X | 25 | 37 | Nov 5/19 | |
| 5 | | | X | X | X | X | X | X | X | | X | | X | X | X | X | | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | | 27 | 47 | Nov 7/19 | |
| 6 | | | X | X | X | X | X | X | X | X | X | X | X | | X | | X | X | X | X | | X | X | X | X | X | X | X | X | X | X | X | X | 28 | 44 | Nov 4/19 | |
| 7 | | | X | | X | X | X | | X | X | X | X | | X | X | X | | X | X | X | | X | X | X | X | | X | X | X | X | | X | X | 24 | 30 | Nov 22/19 | |
| 8 | | | X | | | X | X | | X | X | X | X | | | | | X | | X | | X | X | | | X | | X | X | X | X | | | X | 17 | 44 | Oct 20/19 | |
| 9 | | | X | X | X | X | X | X | X | X | | X | X | X | X | | X | X | X | X | | X | X | X | X | X | X | X | X | | X | | | 25 | 63 | Oct 14/19 | |
| 10 | | | X | X | | X | X | X | X | X | | X | X | X | X | X | X | | X | X | X | X | X | X | X | X | X | | X | X | X | X | X | 27 | 34 | Nov 21/19 | |
| 11 | | | X | | X | | X | X | | X | X | | X | X | | X | X | | X | X | | X | X | | X | | X | X | | X | | X | X | 20 | 46 | Oct 9/19 | |
| Found on Floor November | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 10 | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | 11 | 5 | 8 | 10 | 11 | 8 | 7 | 9 | 8 | 8 | 6 | 8 | 8 | 6 | 7 | 7 | 9 | 10 | 7 | 9 | 10 | 9 | 11 | 5 | 10 | 10 | 10 | 10 | 5 | 9 | 8 | 259 | 466 | Oct 9/19 | |

The above trap-nest record is very complete and is used by one of the students of this school. This shows the record of one of his pens of hens for the month of December.

If more poultrymen would keep accurate records, as to the cost of production, it would be a much easier matter for them to prove to the consuming public, that eggs and poultry are too often produced at a loss and that higher prices should prevail. But without these facts to back up our statements, and without the evidence to prove the truthfulness of these statements, there is left a suspicion in the minds of the consumers, and a feeling that they are paying too much for our productions, in spite of anything we may say.

It is not necessary for the poultryman to keep a complicated or an expensive set of books—the simpler the system, and the more easily understood you can make your methods of keeping accounts, the more satisfactory it is certain to prove to you.

## ACCOUNTS TO KEEP

The number of accounts which you keep will depend somewhat upon the extent of your business, and the branch of the business in which you are engaged. For the average poultryman it is recommended that the following main accounts be kept:

(1) Stock Account—To include poultry, baby chicks, eggs, horses, cattle, hogs, sheep, etc.

(2) Crop Account—To include vegetables, fruits, corn, oats, wheat, hay, etc.

(3) Real Estate—To include permanent repairs, improvements and up-keep.

(4) Labor Account.

(5) Equipment Account—To include investment in incubators, brooders, trap-nests, hoppers, repairs and up-keep.

(6) General Farm—To include feed, seed, supplies, interest and taxes, miscellaneous farm expenses and receipts.

(7) Trade Account—To include trading accounts with Jones' Bros., Smith and Sons, etc.

(8) Bills due me.

(9) Bills I Owe.

(1) Under the Stock Account we keep receipts and expenses from all the classes of poultry and live stock.

(2) Under the Crop Account are entered the receipts and expenses from all the crops grown upon the farm.

(3) Under the Real Estate Account are kept the expenses for permanent improvements, such as new poultry houses, fences, etc., and also a record of the repairs on buildings, lumber for repairs, material and similar items.

(4) Under the Labor Account must be kept a record of the cash paid for regular hired help, any people or extra labor employed for some particular piece of work, such as painting a building, or repairing a fence, should be charged directly to the account or department where the work is being done. If you should judge a poultry show or do some work for another poultryman, credit it a sale, or labor done off your own farm. This should be credited as a receipt in your labor account.

(5) In your Equipment Account should be kept a record of all the equipment used upon the farm which would not be considered a permanent improvement, or a part of the real estate itself. Any investment in new machinery or expenses for repairs and up-keep should be recorded here. If any money is received from sale of equipment, it should be recorded here. If any money is received from sale of equipment, it should be recorded under this account.

(6) In the General Farm Account you should take care of miscellaneous receipts and expenses that are not recorded in any of the other accounts. The most important items you will have are those representing feed supplies, taxes, interest and insurance.

(7) In the Trading Account you should keep a record of the produce, poultry, eggs, fruit, vegetables, etc., which you may exchange at some store or stores for articles used in the house-hold or on the farm. This is an account between yourself and the store with which you are trading.

(8) Under this account of Bills Due Me, keep a record of the

people and amounts due you from other parties other than those included in the Trading Account.

(9) In the Bills I Owe Account, is a record with people whom you owe, other than those included in the Trading Account.

The last three accounts are not necessarily to determine the income from the farm, but they are very useful accounts which every poultryman should keep for his own satisfaction.

## ACCOUNTING AS A MEANS OF STUDYING YOUR BUSINESS

There is far more to accounting and bookkeeping than the mere recording of debits and credits. Poultrymen are beginning to keep cash cost accounts and other records of the internal affairs of their business, in order that they may learn how to conduct their business more profitably and efficiently. One is a simple matter of arithmetic, while the other is a careful study and investigation of the management and profit and loss of the business itself. It is just as necessary to study the part of your business that pays as it is the accounts that do not pay. If one part of your enterprise fails to pay, it does not necessarily mean that that branch of the business should be doubled. A study of the records and of the account may indicate how it may be made to pay. Instead of dropping the business, it may be that it should be increased so as to increase the volume of business and reduce the cost of production. However, it is not often that any enterprise should be carried on for an indefinite length of time that does not pay a reasonable salary. In most cases it can be changed or something else substituted that will pay.

## SCIENTIFIC FARM MANAGEMENT

Scientific farm management is one of the recent developments in the increased agricultural interest in the United States. The University of Minnesota and Cornell University have organized departments that have blazed the trail for a wonderful growth in this work. There is also a Federal office of Farm Management which, under the direction of W. J. Spillman, is making many investigations of great interest.

Before beginning this lesson, we wrote to the leading Agricultural Colleges of the United States and to the office at Washington to get data of investigations of poultry farms, but we fail to find any institution that has made any special investigation of poultry farms in the same systematic way as has been done with dairying and general farming.

We should like to be able to give many reports of farms varying from 500 to 5,000 hens, but such records do not seem available.

Poultry farming is a business, as much so as running a big plantation, a department store or a bank. It is a business which deals with small sales and a business where small leaks can very easily cut profits. The poultryman must know the cost of producting his products and what profit is made when they are sold.

It is more difficult to outline a system of keeping accounts for the poultry farmer than it is for the merchant, for the latter knows just what his goods cost and just what he sells them for. It is not so with the poultry work, as it is necessary to handle many figures that are merely estimates.

Mr. Edward H. Thompson, of the Office of Farm Management of the Bureau of Plant Industry, has issued a bulletin on the subject of Farm Bookkeeping. We submit to you his plan, with some modifications of the figures used in his tables. What he says in regard to general farm bookkeeping is applicable to poultry farming.

The following is taken from Farmer's Bookkeeping No. 511:

"Farming is a business the same as banking or running a department store. It is a business which involves the production and sale of several kinds of products. Two important points must be considered: (1) What does it cost to produce these products? (2) By selling at market prices, what profit is made on them?

"The problem of the farmer is to meet conditions on his own farm in a way which will give him the greatest net returns for his labor and the use of his capital. He should receive interest on his capital as well as wages for his labor, but owing to the lack of proper records few farmers know what wages they actually receive. There is reason to believe that the majority of farmers are really living on the interest of their investments rather than on the profits of their farms.

"A very large number of farm problems have been worked out in the experience of farmers—far more, in fact, than have ever been worked out in any other way. There are some problems, however, which have not been thus solved. The problem of farm bookkeeping is one of these. One of the reasons for this is that what instruction the farmer has had on the subject has been misleading. As in the matter of architecture, so in bookkeeping, the main work that has been done has related to city conditions and is not applicable to conditions on the farm. Hence, it is that the problems of farm architecture and farm bookkeeping are not satisfactorily worked out. These farmers who have tried to keep books have usually used systems devised by city bookkeepers who do not know the conditions to be met in keeping books on the farm. Even where the systems have been modified in the attempt to meet farm needs, they have usually retained features of ordinary commercial bookkeeping that rendered them unsuited to the farmer's needs."

## FARM INVENTORY

The one most important record on any farm is the inventory. A large number of farmers keep a memorandum of cash transactions, including sales and expenses, but never once do they stop to determine the amount of their investment or how their money is invested. An inventory is a sort of guide or milepost, if it may be called such, which tells one where he stands each year. Without it he is absolutely unable to determine the profit or loss on the farm for the year or to determine his net worth.

What is a farm inventory, and what should it include? It is simply a statement showing what the land, buildings, equipment, live stock, and produce on hand are worth at the time the inventory is taken. It is a list of farm property and of farm debts. It should be itemized to show separately what the farm is worth, the value of each piece of equipment for sale, the material or supplies on hand, and the cash on hand or in the bank. It must also show all the bills which the poultryman owes other people and which other people owe him.

The first division should include what is known as real esatte. Under this heading should be placed the land, buildings, fences, lots, and all items of that nature, which it is not desirable to itemize separately, for the farm is thought of as consisting of the land, buildings, and other permanent improvements. If it is sold, all of these items are included. In placing the value on the farm, estimate so much per acre or else fix upon a lump sum.

The next division should be live stock, where the different classes are entered separately—as horses, cattle, poultry, and the like. Each class is itemized as far as practicable. Thus, one can tell any year his total investment in horses or other classes of live stock. In taking this inventory, each fowl and animal should be given a separate value or some method followed so that in taking the second inventory each class or individual can be recognized.

The third division in the inventory should be the incubator, tools, etc. This division contains the largest number of items to be listed, as this part of the equipment on a farm is always varied and consists of a large number of implements. In taking the inventory of the equipment and small tools, it is important to use care not to overlook any item, using the best judgment possible in placing the values on different articles. If anything is overlooked in one inventory and then included in the next, it causes an inaccuracy in the records which could be easily avoided. If it is carefully taken and each item listed separately, an appliance and small tool inventory on a farm will fill several pages. If such detail is not desired, the minor tools valued at less than $1 each may be grouped into a class together and a lump valuation given, but such a course is not advisable. It is surprising what a large number of these small tools there are on a farm, and, furthermore, what a number are misplaced during the year. A carefully itemized inventory taken once a year is a help in locating the minor tools, and inventory day is a convenient time to call in all lent tools, which have a habit of changing owners if they remain too long away from home. All farmers know how easy it is to lose a hammer or an ax, but an old wagon never disappears.

The fourth division of the inventory should include feed and supplies.

The fifth division consists of bills receivable, which should include all bills and accounts due the farm. Each account ought to be listed separately. Of course, these face values do not always represent real values, but each should be noted until it is either settled or proved to be worthless.

The sixth division of the items in an inventory consists of the amount of money on hand and in the bank. This last item should be accurate in every detail.

The sum of these six divisions will be the total investment in the farm. The investment is not necessarily the net worth, for as yet the bills payable have not been deducted. So another division should be made, listing in it bills and accounts payable, the sum of which should be subtracted from the total investment, to obtain the net worth. It must be understood that in his invenory no menion has been made of he household furnishings or personal articles, as only the farm and its accessories have been considered. It is true the house has been included in the value of the farm, but this is necessary, as it is a part of the real estate and would be included if the place were sold.

In using ordinary ruled book for this work it is well to have a separate page for each division of the inventory. For instance, on one page place the real estate and all items pertaining to it, on another the live stock, and so on. Then on another page bring together the totals for each of the different groups to give the total investment. By following this method space will be found for the new items that must be added to the inventory at the end of the year.

## DETERMINING VALUES AND DEPRECIATION.

There are many opinions on the question of how farm values should be determined. It has been suggested that the value of a farm should be its original cost to the present owner, but the objection to this idea is that the present value may be much greater, or in exceptional cases, much less, than the original cost. The increased value may be the result of labor and cash expended thereon in permanent improvements by the owner. Then again, the farm may have cost the present owner nothing, coming to him as a legacy. On the other hand, unusually high or speculative values should not be used, as they are likely to mislead and deceive the owner. This danger of overvaluing the farm and other items must be carefully guarded against, as no benefit can come from it. In taking the farm inventory it is a good rule to place the values on all different items as nearly as possible at the amount for which they could be sold. This must not be construed to be the values that would be obtained at a forced sale, but those secured under normal conditions. This method of placing values on real estate, live stock and machinery may seem unjust in that it is likely to give too low values to the different items. But the danger of placing values too low is not nearly as great as that of getting them too high and then finding at the end of the year that many items did not warrant such high valuations.

In the case of real estate the decrease in value due to natural depreciation is not nearly as great as on machinery. Few accurate data relating to the depreciation of buildings are available; furthermore, it is difficult to estimate such depreciation, and it will vary greatly in different regions. It would seem that a fair allowance for the depreciation of buildings is about three per cent. One's judgment must govern him in using the depreciation figures. It often happens that the increase in land values from year to year will more than offset the depreciation in buildings and other improvements. If this increase in land values is at a moderate rate it may be safe to assume that there has been no net loss on real estate through depreciation for that particular year. Furthermore, on well managed farms, the amount spent for repairs and for the maintenance of the buildings and fences is sufficient to keep them in nearly as good condition as they were at the beginning of the year. In other words, as soon as one stops repairing or keeping up buildings and fences, the rate of depreciation is greatly accelerated.

In determining the values of poultry, one should be governed by the prevailing prices for the different classes, either utility or fancy. Inasmuch as the market varies from year to year, it may be low one year and high the next, thereby decreasing or increasing the capital. It is impossible to overcome this variation, and a man's worth will fluctuate with the market values of what he owns. If no attention is paid to market values it may be found that after a few years certain classes of property may have steadily declined in value, and if inventory values are not decreased accordingly a fictitious profit would be shown each year.

In determining the values of feeds and produce, the farm price should be used. This price should be that obtained at the nearest market, less the cost of transportation to the station.

Upon completing the first inventory the most important of the year's records is finished, for without this inventory one has no basis on which to build future records and is at a loss to know whether he is gaining or losing, while with a good, clear inventory of all his property, he is prepared to keep such records as will give him the information he desires at the end of the year.

## CASH ACCOUNTS

In starting to keep a record of the cash items it is of the utmost importance to know definitely just what records are wanted.

In order to make the cash account balance, i. e., to correspond with the cash on hand or in the bank, one needs to have an account of all expenses. Inasmuch as the household items are usually bought along with the farm items, they must necessarily be included in the records. All the items pertaining in any way to the farm business should be itemized carefully.

A blank form, well adapted for handling these cash items, is known as a daybook form and consists of a plain ruled page similar to that in most books designed for bookkeeping. The right hand column is used for totals and the column to the left of it for the different items. This form is very simple and can usually be obtained at any stationery store. There are various other forms, many of which are useful and possibly better than the one herein described, but farm bookkeeping is not a question of forms; it is a question of what records to keep and how to use them. The most carefully devised bookkeeping blanks will not give good farm records unless the person doing the work has a clear idea of the purpose of the records.

Of the several ways of keeping cash accounts, three will be briefly discussed. A method commonly used by farmers is to enter "Receipts" on one page and "Expenditures" on another. Under one head place all items bought, and under the other, all items sold, as stock, crops and other products.

One method of keeping cash receipts and expenditures:

| | | | |
|---|---|---|---|
| | | RECEIPTS | |
| 1919 | | | |
| April | 2 | 20 sacks corn, at $2 | $ 40.00 |
| | 2 | 100 dozen eggs, at 25c | 25.00 |
| | 7 | 10 sacks oats, at $2.25 | 22.50 |
| | 7 | 1 heifer to J. Brown | 20.00 |
| | 7 | 3 bushels seed potatoes, at $1 | 3.00 |
| | | | $110.50 |
| | | EXPENDITURES | |
| 1919 | | | |
| April | 2 | 1 ton bran | $ 30.00 |
| | 2 | 1 drinking fountain | .35 |
| | 2 | Personal | 2.25 |
| | 2 | Household | 1.60 |
| | 7 | Garden seeds | 8.00 |
| | 7 | Express on seeds | .85 |
| | 7 | Lumber | 2.00 |
| | 7 | Household | .86 |
| | | | $ 45.91 |

For a simple scheme of bookkeeping, the record shown here is very satisfactory and if followed out to the end of the year will give a good record of all business transactions. But if one wishes to know the aggregate income from the sale of eggs or of broilers, it will be necessary to go through the records and pick out all these items and add them separately. In other words, such a record gives the total receipts, but does not classify them. In order to ascertain what enterprise makes a reasonable return to the farm, it is necessary to classify all records under their respective headings. This operation, known as posting the original entries, is nothing more than classifying the items under their respective heads. The totals of these separate accounts can then be added to give the receipts for the year.

Below is illustrated the total cash receipts and cash expenditures for a farm and the distribution of the same.

Statement showing summary of cash receipts and expenditures on a farm for the year:

| | |
|---|---|
| RECEIPTS | |
| Eggs. . . | $2800.00 |
| Apples. . . | 180.00 |
| Potatoes. . . | 100.00 |
| Live Poultry | 300.00 |
| Bills receivable (collected) | 46.00 |
| | $3426.00 |
| EXPENDITURES | |
| Labor. . . | $ 200.00 |
| Feed Purchased | 400.00 |
| Seed. . . | 8.00 |
| Lumber for building | 100.00 |
| Miscellaneous farm | 50.00 |
| Household. . . | 350.00 |
| Personal. . . | 100.00 |
| Taxes. . . | 75.00 |
| Interest on debt | 100.00 |
| Debt (paid) | 500.00 |
| | $1883.00 |

The second method of handling the cash transactions is to make the original entry direct upon its account, that is, instead of putting all the different items down, one after another on one page, to classify them as they are entered in the book.

Cash items entered direct to their respective accounts:

| | | | |
|---|---|---|---|
| | | RECEIPTS | |
| 1919 | | | |
| | 9 | 10 cockerels to Smith | 30.00 |
| | 15 | 100 broilers. . . | 40.00 |
| April | 9 | 100 dozen eggs to Jones | $ 25.00 |
| | | | $ 95.00 |
| | | EXPENDITURES | |
| 1919 | | | |
| April | 2 | 1 ton of bran | $ 30.00 |
| | 10 | 1 cow from Johnson | 60.00 |
| | 10 | 5 sacks corn | 10.00 |
| | | | $100.00 |

By this method, all items pertaining to the sale of milk and dairy products will be put under "dairy," all items for the sale of eggs and poultry will come under "poultry," etc. This is known as entering accounts direct to the ledger, or, as it is sometimes called, a classified daybook. This system has proved satisfactory with many farmers.

The third method is that illustrated below and is similar in principle to the second method, the difference being that as all the accounts appear on two pages it is an easy matter to ascertain the totals and to balance the cash account. Unless a wide blank is used, it does not admit of many accounts, but on most farms only a few are needed.

Form illustrating special column cash book; items entered direct to separate accounts:

| 1919 | | Item | Poultry | Eggs | Crops | General |
|---|---|---|---|---|---|---|
| April | 2 | 10 cockerels to Jones.......... | $ 35.00 | | | |
| | 3 | 10 cases of eggs............... | | $ 100.00 | | |
| | 4 | 20 bushels potatoes ........... | | | $ 10.00 | |
| | | EXPENDITURES | | | | |
| 1919 | | Item | Dairy | Poultry | Crops | General |
| April | 2 | 1 ton wheat bran.............. | $ 28.00 | | | |
| | 2 | 10 bushels seed oats, at $1.... | | | $ 10.00 | |
| | 7 | 2 bags chicken wheat......... | | 2.50 | | |

This special-column cash book can also be used for taking accounts of the expenditures, listing them under several headings, as "Live Stock," "Crops," "Household," "Personal" and "General" expenses, care being taken to exclude anything which is not actually a cash transaction. By keeping the records in this way, one will be able to balance his cash with the totals as shown by the accounts, but if items not cash are included in any of these accounts, it will be difficult to make the records balance. The most detailed records are not usually the best records.

## ANOTHER SYSTEM OF POULTRY ACCOUNTING

We present a system of poultry accounting by Robert R. Slocum, of the Animal Husbandry Division, Federal Department of Agriculture:

One of the greatest needs of most poultry keepers is a definite record of expenditures and receipts. In too few cases does the owner of a poultry flock actually know whether his fowls have been an expense to him or have paid a profit. This is perhaps truer in regard to poultry than with most other branches of the animal industry, because of the facts that both expenditures and receipts are spread over the entire year and are individually small, that a large part of the product is used at home, and that the poultry keeping is incidental to the other farm work.

An effort is made to give in this circular, in the simplest form possible, a system of keeping an account of the poultry flock which will enable the owner to determine its status at the end of each year.

The different blanks or forms necessary are the following: Monthly sheet, yearly summary sheet. inventory sheet, balance sheet, and egg rcord. A sample sheet of each kind has been filled out for guidance in keeping such a record, except in the case of the egg record. These forms or blanks can be ruled off on ordinary loose sheets of paper or in a blank book. The latter plan will usually be found more desirable, as it prevents the different sheets from becoming scattered. When separate sheets are used, they should be, for convenience, not less than eight by ten inches. When a blank is used, one page can be used as the debit side of the sheet and the opposite page as the credit side, which will allow the use of a smaller book.

On the monthly sheet, one of which is used for each month in the year, all eggs and chickens used at home should be credited to the flock at regular market value. Eggs used for hatching at home should be both credited to and debited against the flock at the same price. This price should be their ordinary market value, unless the demand for eggs for hatching purposes is so great that all suitable eggs can be disposed of in this way; in that case, the price should be the regular rate obtained for hatching eggs. The labor of the owner can be estimated and charged against the flock each month if desired. The balance at the end of the year will then show the net profit of the flock. If only the extra labor which may be employed from time to time is charged, then the balance at the end of the year will represent the payment which the flock has made for the owner's labor. Under the column headed "Equipment," on the monthly sheet, should be charged such purchases as incubators, brooders, etc. Lumber, roofing paper, glass, etc., should be charged under

"Miscellaneous." Any day-old chicks sold would most properly be credited under "Breeding Stock."

The yearly summary sheet consists, as it name indicates, merely of a summary of the monthly totals of expenditures and receipts for the year.

The inventory sheet should be used at the beginning of each year to take complete inventories of the equipment, stock, feed, etc. Each piece of equipment should be listed at its actual value at that time. In the case of buildings, which are substantially constructed, five per cent deterioration should be sufficient to allow for the passage of a year's time. In case repairs have been made, the actual value of the building repaired should be given and would probably overcome the deterioration and might even enhance the value over its value in the previous inventory. The deterioration on incubators, etc., with good care, should be about 10 per cent. The actual value of stock on hand should be given. The value may represent market value or its value as breeding stock. In the inventory, the feed on hand, purchased, or set aside for the poultry, should be included. The time of taking the inventory or the beginning of each year, need not be taken as January 1st. Any other date may be chosen if deemed more suitable. Some poultry keepers prefer October 1st or November 1st, as representing more truly the beginning of the poultry year.

The balance sheet will be understood by consulting the sample sheet given. This sheet shows the actual status of the flock for the year.

A simple egg record for the year is also given in blank. It will be found desirable to keep this record in connection with the account, as it will enable the poultry keeper to check up the number of eggs used at home, and thus be sure to credit the flock with them. Columns headed "Average number of hens" and "Average egg production," are alse given and can be used if desired. By keeping these two columns, one is enabled to check up the performance of the hens and determine whether they are giving a satisfactory egg yield.

The "average number of hens" can be easily determined if a record is kept of the deaths each month. The exact average number would be determined as follows: Suppose that in a thirty-day month there were 40 hens at the beginning of the month, that one dies on the 8th and two on the 19th. For the first eight days there were 40 hens, for the next eleven days there were 39 hens, and for the last eleven days there were 37. Therefore, the average number of hens equals

$$\frac{(8\times40) + (11\times39) + (11\times37)}{30} \text{ — } 38.5$$

An approximate average number of hens generally close enough for practical purposes can be obtained by taking the average between the number of hens at the beginning and the end of the month.

Having determined the "average number of hens," the "average egg production" is readily found by dividing the total number of eggs produced by the average number of hens.

### INVENTORY JANUARY 1, 1918

| | | |
|---|---|---|
| 1 | hen house, 15 by 30 feet | $100.00 |
| 1 | 240-egg incubator | 25.00 |
| 2 | indoor brooders | 16.00 |
| 2 | colony houses, 8 by 8 feet each | 40.00 |
| | Miscellaneous—feed troughs, pails, pans, etc. | 10.00 |
| 1 | bushel wheat | 1.25 |
| 1 | bushel of corn | .80 |
| 100 | pounds beef scrap | 3.00 |
| 150 | pounds bran | 2.25 |
| 50 | Barred Plymouth Rock hens | 50.00 |
| 50 | Barred Plymouth Rock pullets | 75.00 |
| 5 | Barred Plymouth Rock cock birds | 10.00 |
| 7 | Barred Plymouth Rock cockerels | 14.00 |
| | Total. | $347.30 |

### INVENTORY JANUARY 1, 1919

| | | |
|---|---|---|
| 1 | hen house, 15 by 30 feet; 5 per cent deterioration | $ 95.00 |
| 1 | 240-egg incubator; 10 per cent deterioration | 22.50 |
| 1 | 150-egg incubator, new | 18.00 |
| 2 | indoor brooders; 10 per cent deterioration | 14.40 |
| 1 | indoor brooder, new | 8.00 |
| 2 | colony houses, 8 by 8 feet each, repaired; no deterioration | 40.00 |

| | | |
|---|---|---|
| | Miscellaneous—feed troughs, pails, pans, etc. | 10.00 |
| 2 | bushels wheat | 2.40 |
| 1 | bushel oats | .60 |
| 100 | pounds bran | 1.50 |
| 50 | pounds beef scrap | 1.50 |
| 27 | Barred Plymouth Rock hens | 27.00 |
| 95 | Barred Plymouth Rock pullets | 142.50 |
| 2 | Barred Plymouth Rock cock birds | 4.00 |
| 12 | Barred Plymouth Rock cockerels | 24.00 |
| | Total | $431.40 |

Dr. **Yearly Summary Sheet** Cr.

| Date | Feed | Equipment | Labor | Miscellaneous | | Total | Market eggs | Hatching eggs | Market poultry | Breeding stock | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1918 | | | | | | | | | | | | |
| January | $11.25 | $18.00 | .... | $ 2.45 | ... | $31.70 | $21.65 | .... | $ 2.35 | ..... | ... | $24.00 |
| February | 10.85 | ..... | $2.00 | 2.00 | ... | 14.85 | 24.83 | .... | 3.30 | ..... | ... | 28.13 |
| March | 11.50 | 20.00 | .... | 9.90 | ... | 41.40 | 20.66 | 6.50 | 3.50 | $10.00 | ... | 40.66 |
| April | 13.80 | 8.00 | 2.00 | 10.47 | ... | 34.27 | 16.63 | 8.75 | 2.35 | 8.00 | ... | 35.73 |
| May | 13.00 | ..... | .... | 5.35 | ... | 18.35 | 11.52 | 4.50 | 4.25 | 8.00 | ... | 28.27 |
| June | 15.50 | ..... | 2.50 | 5.45 | ... | 23.45 | 6.00 | 5.75 | 15.20 | 10.00 | ... | 36.95 |
| July | 14.15 | ..... | .... | 1.10 | ... | 15.25 | 7.08 | 2.00 | 22.15 | 8.00 | ... | 39.23 |
| August | 13.80 | ..... | .... | 4.95 | ... | 18.75 | 5.37 | .... | 13.90 | 4.00 | ... | 23.27 |
| September | 15.00 | ..... | 2.25 | .45 | ... | 17.70 | 9.10 | .... | 10.80 | 3.00 | ... | 22.90 |
| October | 16.10 | ..... | .... | 2.75 | ... | 18.85 | 8.60 | .... | 4.40 | 9.00 | ... | 22.00 |
| November | 4.80 | ..... | 1.00 | 1.43 | ... | 17.23 | 8.17 | .... | 7.85 | 15.00 | ... | 31.02 |
| December | 13.75 | ..... | .... | 8.15 | ... | 21.90 | 12.56 | .... | 4.05 | 20.00 | ... | 36.61 |
| Total | 163.50 | 46.00 | 9.75 | 54.45 | ... | 273.70 | 152.17 | 27.50 | 94.10 | 95.00 | ... | 368.77 |

**Yearly Egg Record**

| Day of Month | January | February | March | April | May | June | July | August | September | October | November | December |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | | | | | | | | | | | |
| 2 | | | | | | | | | | | | |
| 3 | | | | | | | | | | | | |
| 4 | | | | | | | | | | | | |
| 5 | | | | | | | | | | | | |
| 6 | | | | | | | | | | | | |
| 7 | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | |
| 9 | | | | | | | | | | | | |
| 10 | | | | | | | | | | | | |
| 11 | | | | | | | | | | | | |
| 12 | | | | | | | | | | | | |
| 13 | | | | | | | | | | | | |
| 14 | | | | | | | | | | | | |
| 15 | | | | | | | | | | | | |
| 16 | | | | | | | | | | | | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 17 |  |  |  |  |  |  |  |  |  |  |  |  |
| 18 |  |  |  |  |  |  |  |  |  |  |  |  |
| 19 |  |  |  |  |  |  |  |  |  |  |  |  |
| 20 |  |  |  |  |  |  |  |  |  |  |  |  |
| 21 |  |  |  |  |  |  |  |  |  |  |  |  |
| 22 |  |  |  |  |  |  |  |  |  |  |  |  |
| 23 |  |  |  |  |  |  |  |  |  |  |  |  |
| 24 |  |  |  |  |  |  |  |  |  |  |  |  |
| 25 |  |  |  |  |  |  |  |  |  |  |  |  |
| 26 |  |  |  |  |  |  |  |  |  |  |  |  |
| 27 |  |  |  |  |  |  |  |  |  |  |  |  |
| 28 |  |  |  |  |  |  |  |  |  |  |  |  |
| 29 |  |  |  |  |  |  |  |  |  |  |  |  |
| 30 |  |  |  |  |  |  |  |  |  |  |  |  |
| 31 |  |  |  |  |  |  |  |  |  |  |  |  |
| Total |  |  |  |  |  |  |  |  |  |  |  |  |
| Average egg production |  |  |  |  |  |  |  |  |  |  |  |  |
| Average No. of hens |  |  |  |  |  |  |  |  |  |  |  |  |

### Balance Sheet

|  | Dr. | Cr. | Balance |
|---|---|---|---|
| Value of inventory January 1, 1918 | $347.30 |  |  |
| Interest at 6 per cent on capital invested, as represented by value of inventory above | 20.84 |  |  |
| Expenditures during 1918 | 273.70 |  |  |
| Value of inventory January 1, 1919 |  | $ 431.40 |  |
| Receipts during 1918 |  | 368.77 |  |
| Total | $ 641.84 | $ 800.17 |  |
| Balance |  |  | $ 158.33 |

## Monthly Summary Sheet

Dr. Cr.

| Date | Item | Feed | Equipment | Labor | Miscel-laneous | | Total | Date | Item | Market Eggs | Hatching Eggs | Market Poultry | Breeding Stock | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1918<br>April | | | | | | | | 1918<br>April | | | | | | | |
| 1 | 100 bu. beef scrap | $ 3.00 | | | | | $ 3.00 | 4 | 10 doz. eggs, at 24c | $ 2.40 | | | | | $ 2.40 |
| 5 | 4 bu. shelled corn | 3.00 | | | | | 3.00 | 10 | 1 pen breeding fowls | | | | $ 5.00 | | 5.00 |
| 5 | 5 bu. oats | 3.25 | | | | | 3.25 | 12 | 18 doz. eggs, at 24c | 4.32 | | | | | 4.32 |
| 8 | Carpenter work on brooder. | | | $ 2.00 | | | 2.00 | 13 | 1 hen (home use) | | | $ .55 | | | .55 |
| 8 | Lumber. | | | | $ 4.00 | | 4.00 | 14 | 3 market hens | | | 1.80 | | | 1.80 |
| 10 | 1 indoor brooder | | $ 8.00 | | | | 8.00 | 15 | 8 doz. eggs (home use, 24c | 1.92 | | | | | 1.92 |
| 10 | 6 gallons kerosene | | | | $ .72 | | .72 | 17 | 15 doz. eggs, at 23c | 3.45 | | | | | 3.45 |
| 19 | 300 eggs for hatching | | | | 5.75 | | 5.75 | 19 | 7 doz. eggs (home use) 23c | 1.61 | | | | | 1.61 |
| 20 | 100 lbs. oyster shell | .80 | | | | | .80 | 19 | 300 eggs, hatching (home use) | | $ 5.75 | | | | 5.75 |
| 25 | 3 bu. wheat | 3.75 | | | | | 3.75 | 20 | 50 day-old chicks | | | | 3.00 | | 3.00 |
| | | | | | | | | 23 | 7 doz. eggs (home use) 23c | 1.61 | | | | | 1.61 |
| | | | | | | | | 29 | 100 eggs, hatching | 3.00 | | | | | 3.00 |
| | | | | | | | | 30 | 6 doz. eggs, at 22c | 1.32 | | | | | 1.32 |
| | Total | $13.80 | $ 8.00 | $ 2.00 | $10.47 | | $34.27 | | Total | $16.63 | $ 8.75 | $ 2.35 | $ 8.00 | | $35.73 |

## ONE PLAN OF OPERATION

Mr. Rolla C. Lawry, of Pacific, Missouri, has a model plan of operation at the Yesterlaid Egg Farm. His method of management is such as to reduce labor to a minimum. His plan that we present, which is outlined in his book, Poultrology, is worthy of very careful study.

He is not only one of the leading scientific poultrymen of America, but he knows how to make practical use of his scientific knowledge. He is one of the pioneers in handling fowls in very large units. He has demonstrated that it is possible to establish a big commercial egg farm in the central states, and, by using modern methods of marketing, reach customers with high-class, fresh eggs.

We wish to give credit to Mr. Lawry for the following discussion of System of Management and Professional Ethics:

## SYSTEM OF MANAGEMENT

At the outset an organization should be built up in a way calculated to avoid the failures which are sometimes found on poultry farms. In other words, the farm should be operated just exactly as any successful business would be operated.

The manager should have his office on the farm and be governed by a general policy laid down by the Board of Directors. This policy necessitates that every move must clearly demonstrate its business soundness before it is sanctioned by the Board. The superintendent has his work carefully planned, outlined and checked by the manager. The foreman in charge of the different departments are directly responsible to the superintendent for all routine work done by them or the men under them. By this system of organization, all fancifull enthusiasm which might lead to the adoption of impracticable ideas and devices is avoided, and costs are continually checked and rechecked, and reduced if possible. This scheme has made possible the establishment of systematic routine, which is so highly desirable in any business and which has proven very efficient and profitable in this application.

All activities of the farm are made to center around the All-purpose Building, in which is located the manager's office. This building has two stories and a basement. The floor space is used for the following purposes: Basement has stable room for six horses and two cows; room for steel storage tank for water supply and pumping machinery; room for sorting and packing market eggs; bath room for attendants; storage bin for cut clover and alfalfa; room for gasoline engine air compressor and electric lighting plant; room for steam cooker, power bone cutter and power feed mixer. First floor has central driveway 12 feet wide, on one side of which is located carpenter shop, harness room, stairs to basement and to second story, and room for trucks, wagons and other vehicles. A wagon scale is located in the driveway for weighing all incoming feeds, fuel, litter, etc. On the opposite side of the driveway is the manager's office, machinery floor and room for storing grain. The machinery on this floor consists of a corn sheller, corn cracker, meal grinder, clover cutter, grindstone and carborundum wheels for sharpening discs, sickles and other farm tools. Second story has storage for from 50 to 60 tons of baled hay and straw; storage room for knocked-down egg cases and shipping coops and dormitory for two men.

A complete system of records is made up of daily postings from individual house reports.

Prior to the first of January there is placed in each of the houses a printed calendar pad which contains separate report blank for every day of the year. As he does his work, the attendant enters on this daily record the data to be reported to the office. Before he quits work in the evening he has merely to tear off one sheet from the calendar in the house which he then turns into the office. These daily reports are posted each morning to their regular accounts in a book containing specially ruled forms. These daily postings enables the management to know at all times how much stock of all ages there is on hand; what the death rate has been; what the number sold has been; how much feed has been used in a given month and to date; how much the sales have been on any given item for any given month, or to date;; what the yield per hen per month has been for any year and for all years to date; in fact, everything that it is required to know in order to operate the farm successfully and with profit is posted daily, so that, at any time, the manager can put his finger directly on what he wants to know.

The system of records has enabled the work to be planned ahead with great accuracy. A good example of the efficiency of this system of accounting was demonstrated during the hatching period of a previous season. The orders for hatching eggs came in so much faster than they could be handled that a large sheet was prepared, basing our calculations on production of previous years, to show how many eggs we could expect to collect on each day for the three and one-half months of the hatching season rush. This sheet was also made to show, as a result of the past records, what percentage of eggs collected would have clean, well-formed shells so that they could be used for incubation. In other words, it was made to show the net number of eggs that we could promise for prompt delivery on every day of the hatching season. Egg orders were booked for shipment in accordance with this prepared sheet, and with only one or two exceptions there was no delay whatsoever in making the shipment on time.

## PROFESSIONAL ETHICS

With poultry raising, like every other activity of man, there should be a code of ethics. If the reader plans to enter the market at any time with stock eggs for sale, he should do all in his power to justify the confidence of his prospective customers. Whether the reader is a buyer or a seller, reason should rule in all his transactions. It is not right for a seller to promise too much; to lead his customer to expect too much and then disappoint him. It is not right for the customer to expect the impossible from the seller. An unconditional guarantee of satisfaction is impossible on the part of the seller, because he has no way of knowing whether it is possible to satisfy all of his prospective customers.

Yesterlaid Egg Farms Company, in dealing with its prospective customers, never holds out any impossible guarantee of satisfaction. They endeavor not to build up expectations which they cannot gratify. They enter the field knowing that it is not always possible to supply every person with just what they want at a price that will please them. The company solicits all business, accepts all orders and makes all sales with this motto before them: "It is impossible for a reasonable-minded person to deal with Yesterlaid and not be satisfied." Stock is always shipped with the distinct understanding that if upon examination it does not thoroughly please, if it does not look like the customer's money's worth, it can be returned promptly and the customer will get his money back. This agreement is made with the reasonable restriction that the stock be returned within two days after it has been received and that the customer first notify us that it is to be returned and that it be allowed to rest before it is recooped.

A shipper should not be held responsible for damage brought about by transportation companies, such as exposure, neglect, or injury, but most shippers will be only too glad to help the customer share the loss if they are given a chance.

Before filing a complaint, the buyer should always endeavor to put himself in the shipper's shoes. In fact, the first communication should not be a complaint, but should be an inquiry. If you purchase from a breeder, it is because in his advertisements and in his literature he has been able to convey to you confidence in his stock and in his methods of doing business. You have come to believe that he is sincere and that he will do everything he has promised you he would do in his advertisements, his literature, and in his letters. It is consistent then to give him an opportunity to explain apparent shortcomings, to tell you whether he will help you share some damage caused to your shipment by the transporting company, or to explain some point that you do not understand.

The writer has known cases where customers, who have bought in apparently the best of faith, have had their shipments roughly handled by an express company and have promptly written the most abusive sort of letter without offering the shipper an opportunity to explain or to express his willingness to help bear the loss.

Do not be too hard on the express company. Be reasonable and fair with them, too. Do not expect the impossible of them. There is not one case of damage in a hundred that is intentionally brought about and hardly one case in fifty that is avoidable. The express messengers are human and, as a rule, strive to do their day's work to the best of their ability. Oversight and breakage are certain to occur in any business of such enormous magnitude as the handling of packages by express companies. We have had packages handled by every express company doing business in the United States and have yet to find an official or representative of any of these companies who is not ready and willing to adjust a reasonable claim for any kind of damage or loss. If you have a claim, make it in a business-like way, just as you would expect it to be made to you if you were a representative of an express company.

Some of the reasons for dissatisfaction between the customer and the seller are: Buying when the plumage is green or new; buying when the plumage is old, soiled or ragged; pale shanks; cream in the plumage; high and wry tail, and purple or withered combs.

When stock is purchased between June and November it does not appear at its best, because where it has not begun to molt the plumage appears old and faded and shabby, even on stock which has had the best of care. In buying stock between these dates dissatisfaction also sometimes arises from creamy plumage, because the fowl has begun to molt and the new incoming feathers are full of sap and show a creamy color, which they would not have after the feathers were fully formed.

Where stock is shipped a long distance it is not unusual for the comb to become pale and purple and to lop over, and for the chicken to seem dumpy for a few days. This is merely the effect of the long journey, of being cooped up in a small space. A wilted or droopy comb is due to heat and a purple comb is the result of the same cause.

## RECORD KEEPING

There is no line of live stock farming that does not demand record keeping. It is just as necessary to keep tab on your poultry operations as it is to keep books in any other line of business. Especially is this true of a business which has so much detail. The business is made up of many little things and the memory cannot be counted on to keep up with the many details connected with the work.

Record-keeping should not be confined to the College or Experiment Station plant. A record properly kept will not only afford pleasure, but will furnish a guide for future operations. If losses are occurring at some one place it is necessary to know where, so that the losses can be eliminated.

A specific branch can have the leak which is a constant drain on some one part of a business that is otherwise paying a profit. If the conditions cannot be remedied that special part of the work can be cut out. For example, suppose that the hatching department shows that it does not pay to sell baby chicks, but that a demand can be secured for all of the eggs at good prices. The leak should be found or this part of the work dispensed with. Or suppose that you are engaging in broiler raising and it is found that there is a loss; then it can be dispensed with and the eggs placed on the market.

There is no doubt that well kept records will make the work a much greater pleasure than if you work blindly. We fully realize that it is not possible for you to keep records such as are necessary on an Experiment Station plant, but it is possible to make use of some of these records in your work. We do not give you all of these records with a view to using all of them on a commercial plant but you can adopt such records as you think would suit your conditions.

The records that you keep should be as simple as possible and at the same time give you the information desired. There is not going to be much time for the keeping of very complicated records and a simple system should be used that will take little time. The loose leaf filing system is one of the most convenient systems that can be used. With

# American Poultry School

Kansas City, Mo.

# INCUBATOR RECORD

*Incubator* ..................................................

*Date Set* ..................................................

*Date Tested* ..................................................

*Date Tested Second Time*..................................................

*Name of Operator*..................................................

| BREED | Hen No......... | Pen No. ......... | Number of Eggs Set | Infertile......... | Dead Germs-- | Fertile......... | Dead in Shell | Total Hatch..... | Cripples......... | Good Chicks to Brooder | Per cent Fertility | Per ct. Fertile Hatched | Per cent Dead Germs | Per cent Die in Shell | Oil Consumed |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | | | |
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| | | | | | | | | | | | | | | | | |
| TOTAL | | | | | | | | | | | | | | | | |

Day and hour began to hatch.................................Day and hour through hatch.................................

## INCUBATOR TEMPERATURE, ETC.

| Day | INCUBATOR | | | Room | Outdoor | Hygrometer | T | T | C | M | Day | INCUBATOR | | | Room | Outdoor | Hygrometer | T | T | C | M |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | A. M. | Noon | P. M. | A. M. | P. M. | A. M. | | | | | | A. M. | Noon | P. M. | A. M. | P. M. | A. M. | | | | |
| 1 | | | | | | | | | | | 12 | | | | | | | | | | |
| 2 | | | | | | | | | | | 13 | | | | | | | | | | |
| 3 | | | | | | | | | | | 14 | | | | | | | | | | |
| 4 | | | | | | | | | | | 15 | | | | | | | | | | |
| 5 | | | | | | | | | | | 16 | | | | | | | | | | |
| 6 | | | | | | | | | | | 17 | | | | | | | | | | |
| 7 | | | | | | | | | | | 18 | | | | | | | | | | |
| 8 | | | | | | | | | | | 19 | | | | | | | | | | |
| 9 | | | | | | | | | | | 20 | | | | | | | | | | |
| 10 | | | | | | | | | | | 21 | | | | | | | | | | |
| 11 | | | | | | | | | | | 22 | | | | | | | | | | |

**Key: T—Turned. C—Cooled. M—Moisture added.**

The above shows a good incubator record. These sheets are tacked on a board which hangs below the incubator door and swings on screw hooks and eyes fastened to the bottom of the machine and the top of the board.

## PEDIGREE INDEX

| CHICK Band No. | ADULT Band No. | MATING No. | CHICK Band No. | ADULT Band No. | MATING No. | CHICK Band No. | ADULT Band No. | MATING No. | Numbers FROM TO | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | CHICK Band No. | ADULT Band No. | MATING No. |

This illustrates one method of keeping a pedigree index to the individual record shown below. These can both be printed on cards or sheets of a little larger size than shown herewith.

## INDIVIDUAL RECORD

VARIETY DATE HATCHED ADULT BAND NO.

SEX WHY KEPT CHICK BAND NO.

BRED IN PEN NO. YEAR OUT OF MATING NO.

THIS BIRD WAS BRED IN ______ WITH

| ♀ NO. | MATING NO. | ♀ NO. | MATING NO. |
|---|---|---|---|
| ♂ NO. | MATING NO. | ♂ NO. | MATING NO. |

DESCRIPTION

| | |
|---|---|
| WEIGHT | |
| HEAD | |
| COMB | |
| PLUMAGE | |
| SHANKS | |
| GENERAL VIGOR | |
| PHOTO. NO. | AUTOPSY NO. |
| AVERAGE FERTILITY | |
| AVERAGE HATCHING | |

HOW DISPOSED OF?

REMARKS

some phases of poultry work it is not necessary to do much copying of figures. For example, in keeping an egg record it is possible to use a record in the house that can be transferred to the binder at the close of the month and thus give the record without the necessity of having to copy them into a book. In poultry management, as in every other business enterprise, there must be a fixed policy to which you must adhere strictly and not continue to change at every slight failure.

After making a complete study of prices of feeds in your community, decide definitely what is going to be your ration; decide what hours you will feed and stick to these hours. Decide on about the number of chicks you will need each season to supply your wants and work with this definite program in mind. Decide on how many hens you wish to carry when you get your plant to working full capacity so that you will know just how to locate your houses. After you have decided fully on a policy, stick to it. Of course, sometimes the general plan will have to be modified but many make their decisions too quickly when trouble arises and begin the rapid change of methods which are apt to upset and tear to pieces rather than place you on a firmer footing.

There is little time on a large commercial poultry plant to be devoted to trap-nesting and pedigreeing. If the aim is commercial eggs it is possible to keep a few hens of the very best from which the young stock can be reared to renew the general flock. This character of the work demands a great deal of time and attention. It not only takes time to trap-nest but the work of pedigreeing requires clerical work, but it pays and pays well.

There is a big demand for pedigreed stock, which affords a wide field for progressive breeding farms. The records kept must be simple and so arranged that you can get the information wanted at a glance.

For the pen record it is possible to use a sheet that can be filed in a ledger, thus saving time in the transferring which is required in some systems of record-keeping. This sheet should have space to put down dates for filling hoppers and other information needed.

## INCUBATOR RECORDS

The incubator record furnishes a valuable guide which makes the operator far more efficient in handling the incubators. These records should be filed away for future reference. But the number of incubator, the date set, date tested; the temperature of the room in the forenoon and afternoon; the number of dead germs, infertile and fertile eggs; per cent hatched; the vigorous chicks; per cent dead in shells, etc.

## BROODING RECORDS

It is also helpful to keep brooding records if the poultryman wishes to study the efficiency of his system. The record should show the number of strong chicks placed in the brooder; the temperature of room and brooder to be recorded twice each day; the ration used with the dates of changes; the daily mortality; the total mortality can be shown on the date they are removed to the colony houses.

The simplest method of keeping records that we have ever seen is one prepared by Prof. Patterson of the Missouri Experiment Station. This record is for ten hens to the pen. The numbers run from 0 to 9 making ten numbers. The male number is the same number as the phen. For example, let us use pen 25. The male's number would be 25. The number of the females would be 250, 251, 252, 253, 254, 255, 256, 257, 258, 259.

When a chick is hatched from this egg, the number 257 can be placed on the chick's leg band; also the date of the hatch. If the chick was hatched on March 15th, the leg band of the chick would bear the number 315.257. It was hatched on the 15th day and the 3d month. The number 257 would indicate the mating from which the chick came.

Labor costs increase as the plant grows from a back yard proposition to a poultry plant, planned with a view to making a livable income. To the back yard poultryman the cost of labor is not included when he makes his estimate of just what the net profits are. But this is quite an item on the large farm and the important feature is to so plan and and arrange every building that labor may be saved. The man with plenty of money, who wishes to buy a poultry farm outright and not build gradually, makes the overhead charges so great that in many instances the hen cannot earn interest on the investment. Keep down costs and at the same time arrange everything so that steps can be reduced to a minimum and the plan will combine convenience and efficiency.

# American Poultry School

## Kansas City, Mo.

## BROODER RECORD

BROODER ..............................

CHICKS FROM ..............................

DATE PUT IN BROODER ..............................

NO. OF CHICKS PUT IN BROODER ..............................

OPERATOR ..............................

| Day | A. M. | Noon | P. M. | Cleaned | Disinfect'd | Dead from Disease | Killed by Accident | Hours Watered | | Hours Fed | | | | | Weight of Chicks | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | | | | | | | | | | | | | | | |
| 2 | | | | | | | | | | | | | | | | |
| 3 | | | | | | | | | | | | | | | | |
| 2 | | | | | | | | | | | | | | | | |
| 22 | | | | | | | | | | | | | | | | |
| 23 | | | | | | | | | | | | | | | | |
| 24 | | | | | | | | | | | | | | | | |
| 25 | | | | | | | | | | | | | | | | |
| 26 | | | | | | | | | | | | | | | | |
| 27 | | | | | | | | | | | | | | | | |
| 28 | | | | | | | | | | | | | | | | |

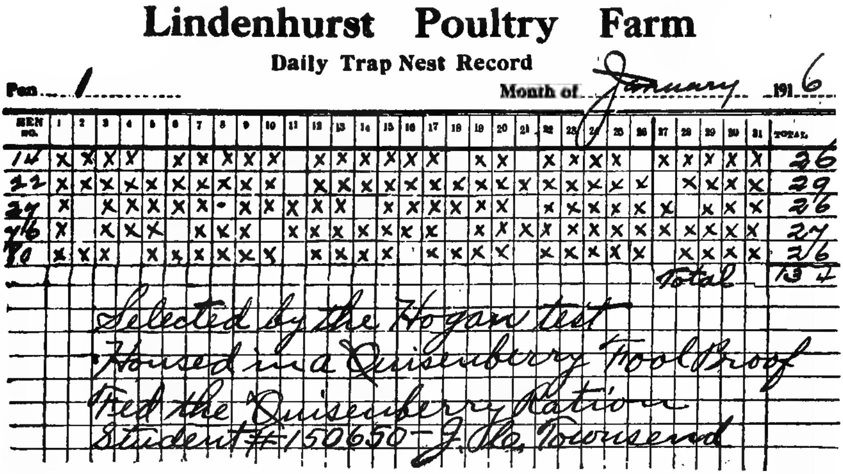
This is a method of keeping a complete record of the results of your brooding operations. There should be one space for each day of the month.

In making your estimates of net gain you must always take into consideration the labor and the interest on the investment, and not merely consider the cost of feed. There must be careful management, in order to make a profit on the investment and a salary for the owner.

One of the big problems that every beginner must contend with is the question of breeds. That is a matter that everyone must settle for himself after making a study of the breeds. The greatest factor that will influence future success is the strain that is carried and the attention given to this strain to perfect it.

### KEEPING EGG RECORDS

It is important to keep a record of the eggs produced by your hens If you have a sheet of paper or cardboard on the wall, with a lead pencil beside it, it is a very easy matter to mark up the eggs produced each day. The eggs should be counted and put down as they are taken from the nests. The eggs used in the home, the number sold or incubated can be subtracted from the number laid and an accurate record kept of just what becomes of your product. If nothing more is done the record sheets may be marked up similar to the form shown above and the same kept in a convenient place in the poultry house. All poultry should be counted once or twice a year and a record kept of sales, deaths, and those eaten, and the number on hand at the end of the month can be found by subtracting. Slight errors may occur, but this record will let you know just what you are doing from time to time.



**Lindenhurst Poultry Farm**

**Daily Trap Nest Record**

Pen 1

Month of January 1916

| HEN NO. | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | TOTAL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12 | X | X | X | X |  | X | X | X | X | X |  | X | X | X | X | X | X |  | X | X |  | X | X | X | X |  | X | X | X | X | X | 26 |
| 22 | X | X | X | X | X | X | X | X | X | X |  | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |  | X | X | X | X | 29 |
| 27 | X |  | X | X | X | X | X | • | X | X | X | X | X |  | X | X | X | X | X | X |  | X | X | X | X | X | X |  | X | X | X | 26 |
| 76 | X |  | X | X | X |  | X | X | X |  | X | X | X | X | X | X | X |  | X | X | X | X | X | X | X | X | X | X | X | X | X | 27 |
| 10 | X | X | X |  | X | X | X | X | X | X |  | X | X | X | X |  | X | X | X | X |  | X | X | X | X | X |  | X | X | X | X | 26 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | Total |  |  | 134 |

Selected by the Hogan test

Housed in a Quisenberry Fool Proof

Fed the Quisenberry Ration

Student #150650 — J. W. Townsend

The above is a very good method of keeping egg records. It is the system used by one of our students.

| January 1920 | No. Eggs | Died |  |  | On Hand, 96 Hens, 216 Pullets, 9 Roosters |
|---|---|---|---|---|---|
|  |  | Hens | Pullets | Roosters | Sold and Eaten |
| 1 | 22 |  |  |  |  |
| 2 | 22 |  |  |  |  |
| 3 | 24 |  |  |  |  |
| 4 | 23 |  | 1 |  | 1 Rooster Sold |
| 5 | 24 |  |  |  |  |
| 6 | 31 |  |  |  |  |

### DEPRECIATION ON POULTRY

The average depreciation on hens by death is something like twelve per cent a year, or is usually estimated at one per cent per month. In especially well managed flocks the loss will range as low as five to ten per cent per year.

On high priced stock the depreciation is much greater than on common stock. The meat value of a common hen is practically the full value of the bird, and there is not much depreciation other than the loss by death.

Dr. Warren, who is an expert in farm economics, makes the following estimate of the depreciation of hens and he bases his figures on the price of poultry when poultry was much cheaper than it is at the present time.

If we start with 100 pullets, we may expect to have 88 at the end of the first year. If the hens are then sold for meat at 40 cents apiece, they would bring $32.50. On pullets worth 50 cents apiece this would give a loss of $14.80, or 30 per cent.

If the same pullets were kept two years we would expect to have seventy-seven left to sell for $30.80. This would be a loss of $19.20 for the two years, or 20 per cent a year.

If kept three years, we would expect to have sixty-eight still living to sell for $27.20. This would make a loss of $22.80 for the three years or 15 per cent a year.

The table below shows similar calculations for pullets worth $1.00 and $2.00.

If $2.00 pullets are sold at the end of one year, the depreciation would be $1.65 per hen, or 82 per cent. This would be equal to 7.5 dozen eggs at the average price in Ohio. Evidently, one could not use such pullets for producing eggs to sell at wholesale prices, unless they are kept more than one year. If such pullets were kept until three years old, the depreciation would be 58 cents a year, equal to 2.6 dozen eggs a year.

It is evident that common stock may be sold young, but that high-priced poultry should be kept until it is older. If the meat value is 40 cents, and pullets are worth 50 cents, it would not pay to keep old hens unless they laid within 10 cents' worth of as many eggs as a pullet. No old hens are likely to do this well.

If pullets are worth $1, it would pay to keep a hen as long as her eggs are worth within 60 cents of those laid by a pullet. This is a difference of two or three dozen. Hens two or three years old will usually do so well.

If pullets are worth $2, it will pay to keep a hen as long as her eggs are worth within $1.60 of those laid by a pullet. This would be a difference of seven dozen at the prices in Ohio. If any pullet is really worth $2 for producing market eggs, it would appear best to keep her as long as she lives. However, if eggs from such stock are worth so much to sell for breeding purposes that the average price o fall her eggs sold is 60 cents a dozen, then the old hen should go when her egg production falls three dozen below the pullet. This would probably be two or three years.

The price of eggs, the price at which old hens are sold, the relative value of old and young hens for breeding purposes, and various other factors, affect the results. The above discussion shows the method of figuring.

**Depreciation on Hens That Have a Meat Value of 40 Cents and a Death Rate of 12 Per Cent**

| | Value of Pullets | | |
|---|---|---|---|
| | $ .50 | $1.00 | $2.00 |
| Hens kept one year— | | | |
| Depreciation | $ .15 | $ .65 | $1.65 |
| Per cent depreciation | 30% | 65% | 82% |
| Hens kept two years— | | | |
| Depreciation | $ .19 | $ .69 | $1.69 |
| Depreciation per year | .10 | .35 | .85 |
| Per cent depreciation | 20% | 35% | 43% |
| Hens kept three years— | | | |
| Depreciation | $ .23 | $ .73 | $1.73 |
| Depreciation per year | .08 | .24 | .58 |
| Per cent depreciation | 15% | 24% | 29% |

# MISSOURI STATE POULTRY EXPERIMENT STATION

## T. E. QUISENBERRY. DIRECTOR, MOUNTAIN GROVE, MO.

*Egg and Feed Record for the Month of*........................................*191*......

*Variety*........................................ *House No.*.................... *Pen No.*....................

| BAND NUMBERS | DAYS OF THE MONTH | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | Monthly Total | Total to Date | FEED AND LITTER | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | | | Grain | Mash | Grit | Shell | Sund. |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Daily Totals | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

**% Production**

**Cost of Feed Consumed, $**

**Profit or Loss, $**

**REMARKS:**

**KEY:** D, dead; S, sick; B, broody; O, over-broodiness; X, broken egg; E, egg eaten; M, moulting; H, hen; P, Pullet; F, egg on floor.

The above egg and feed record sheet is the one used by Mr. Quisenberry at the Missouri Experiment Station. Longer sheets having more room for the band numbers of a larger number of hens may be used for large flocks. Record the lowest number first and the highest number last.

The young stock from valuable animals usually rises in price fast enough to more than make up for the high depreciation on their parents. In making calculations, this point is nearly always considered, but the higher depreciation on parents is forgotten. One must consider both sides of the question if he is to arrive at the truth.

## SURVEY OF POULTRY FARMS SHOWING FACTORS INFLUENCING PROFITS

Farm surveys of one kind or another have been made in practically every state. Most of these have been attempted in the interest of dairying, live stock, horticulture or general farming. There has been no survey, in my opinion, as complete and useful from a poultryman's standpoint as that made in New Jersey by the poultry department of their Agricultural Experiment Station. A careful study was made of 150 poultry farmers, of their requirements for success, and the reasons some were lacking in profits. This information is so valuable to every poultryman that I quote their findings quite completely and fully for your benefit, and I have included only such statements and opinions as I have found to be true in my own survey, observation and study of poultry farms, poultrymen and poultry problems in most other states as they apply to same. The men who made and compiled the following survey are to be congratulated.

### CAPITAL

It is sometimes stated that the same amount of capital is required for success in any type of farming. However, for poultry farming, the amount necessary for success is less than for other types. This is a decided advantage. For a young man to start out and earn sufficient capital to buy and equip the average farm today, is a difficult task. For the man from the city, who has but $5,000 to $10,000 saved from his earnings, capital is usually his limiting factor for success. So far as the results of the survey of all the farm types that have been studied in this department show, poultry raising is the most successful operation for farmers having small capital.

### AMOUNT OF CAPITAL AND DISTRIBUTION

The average capital per farm was $7,243, a very moderate sum when compared with that of other farm types. Of this amount, 76.9 per cent is in real estate and 15.8 per cent in stock, 4.3 per cent in machinery, 1.5 per cent in supplies and 1.5 per cent in cash. The proportion in real estate is small when compared with that of other types of farming, but the buildings are worth an average of $2,925, or 52 per cent of the real estate values. The poultryman's dwelling is worth $1,662, or about 30 per cent of the total real estate value. Much of this investment is necessary for the operator's house. The necessary investment in land is comparatively small, yet the value per acre is $480, a comparatively large amount. The buildings and fences added to the land have materially raised the acre value, the buildings alone having

**Amount and Distribution on 150 Poultry Farms in New Jersey**

| CAPITAL PER FARM | Number of Farms | Real Estate | | Stock | | Machinery | | Feed and Supplies | | Cash | | Total Capital |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Value | Per Cent of Total | Value | Per Cent of Total | Value | Per Cent of Total | Value | Per Cent of Total | Value | Per Cent of Total | |
| $3,000 or less.. | 3 | $1,900 | 76.9 | $ 431 | 17.4 | $ 66.70 | 2.7 | $ 33.30 | 1.5 | $ 33.30 | 1.5 | $2,470 |
| $3,001 to $5,000 | 29 | 3,217 | 74.7 | 802 | 18.6 | 179.20 | 4.2 | 54.10 | 1.4 | 49.10 | 1.1 | 4,298 |
| $5,001 to $7,000 | 45 | 4,638 | 78.4 | 905 | 15.6 | 229.90 | 3.9 | 61.60 | 1.0 | 64.80 | 1.1 | 5,924 |
| $7,001 to $9,000 | 38 | 6,125 | 76.6 | 1,307 | 16.3 | 329.50 | 4.1 | 117.60 | 1.5 | 116.20 | 1.5 | 7,995 |
| $9,001 to $11,000 | 22 | 7,673 | 77.9 | 1,456 | 14.8 | 411.80 | 4.2 | 163.50 | 1.7 | 138.40 | 1.4 | 9,841 |
| $11,001 & over. | 13 | 9,731 | 75.1 | 1,837 | 15.8 | 709.30 | 5.5 | 302.40 | 2.3 | 296.90 | 2.3 | 12,876 |
| | 150 | $5,572 | 76.9 | $1,146 | 15.8 | $310.30 | 4.3 | $109.60 | 1.5 | $105.10 | 1.5 | $7,243 |

an acre value of $250, leaving an acre value for land and fences of $230. The average value of land itself was about $200 per acre.

### AMOUNT OF CAPITAL AND LABOR INCOME

Like other types of farming, greater profits are derived when sufficient capital is available for conducting an economic business of large volume. On these 150 poultry farms, profit increased with each increased investment until the class of farms having over $11,000 was reached (table 5.) This class had slightly decreased profits.

| CAPITAL | No. of Farms | Average Capital | Birds per Farm | Labor Income | Investmen Per Bird |
|---|---|---|---|---|---|
| $3,000 or less.... | 3 | $2,470 | 332 | $196 | $7.44 |
| $3,001 to $5,000.. | 29 | 4,298 | 513 | 351 | 8.38 |
| $5,001 to $7,000.. | 45 | 5,924 | 616 | 580 | 9.63 |
| $7,001 to $9,000.. | 38 | 7,995 | 852 | 743 | 9,38 |
| $9,001 to $11,000. | 22 | 9,841 | 923 | 1,270 | 10.66 |
| $11,001 and over | 13 | 12,876 | 1,095 | 1,259 | 11.76 |
|  | 150 | $7,243 | 737 | $730 | $9.83 |

Though the number of farms is too small to permit the drawing of absolute conclusions, these data would tend to show that an investment of $15,000 or more, in the hands of the average poultryman, would not return so great a profit as $10,000 to $12,000. The highest labor income ($3,867) was obtained from an investment of $10,910. The highest amount of capital per farm was $15,455, and the labor income from this farm was $1,216. The investment per bird increases with increased capital. Apparently, this increased capital is for a larger business as well as a more pretentious outlay. This large investment ha sbeen made from the standpoint of pleasure as well as of business.

The lowest investment per farm was $2,131, and this farm gave a minus labor income of $208. The greatest loss was a minus labor income of $1,013, on a farm where the capital amounted to $6,092. Much of this loss was due to sickness and dying of the chickens.

### RETURN ON CAPITAL INVESTED

The capitalist is usually most interested in the rate of interest he will receive on the money he invests. The farmer is more interested in the total return above his 5 per cent interest charge. If $15,000 will return $2,550 above expenses, the return would be at the rate of 17 per cent on the investment. Should the farmer invest $10,000 and receive $1,800 above expenses, the return on the money invested would be 18 per cent, or a higher rate of interest, but less money is left for the farmer to live upon after deducting the 5 pe rcent interest. In such a case the operator could afford to increase his business with a $5,000 added investment and be more prosperous. The farmer views the business as a unit from which to obtain a living, and not as a mere investment.

**Relation of Capital to Return on Investment in 150 Poultry Farms in New Jersey**

|  |  | Return Per $1,000 Invested | Per Cent Return |
|---|---|---|---|
| $3,000 or less........................ | 3 | $129 | 12.9 |
| $3,001 to $5,000...................... | 29 | 132 | 13.2 |
| $5,001 to $7,000...................... | 45 | 138 | 13.8 |
| $7,001 to $9,000...................... | 38 | 143 | 14.3 |
| $9,001 to $11,000..................... | 22 | 179 | 17.9 |
| $11,001 and over...................... | 13 | 148 | 14.8 |
|  | 150 | $151 | 15.1 |

The average return on the investment was 15.1 per cent (table 6). To obtain this the operator gave all his time and supervision. The highest return was obtained for an investment of $9,000 to $11,000. This appears to be the most efficient capitalized unit for these poultry farms. A man should have at least $5,000 to $7,000 before he can hope to be moderately successful with poultry.

## RELATION OF SIZE OF FLOCK TO LABOR INCOME

The average number of chickens per flock on these farms was 736, of which 17 were cockerels. There was an average of forty-three hens per cockerel. The labor income for these flocks increased with each increase in size of flock. The lowest labor income per flock was received on farms having less than 300 birds, while the highest was from the farms having over 1,500 birds per flock.

These flocks have not, as a class, become too large for the greatest profit. The greatest profit per hen was obtained from flocks of from 900 to 1,100 birds. Larger than this, the profits per bird began to decrease. When smaller than this, the profits likewise decreased. From the standpoint of the individual hen, this was the most efficient unit, or size of flock. But for larger total profits per flock, a larger number of birds is necesssary. The eight farms having an average of 1,807 fowls per farm gave the largest labor income. How much more these flocks could be increased and bring a larger profit is not shown on these farms. It appears, however, that the profits per bird began to decrease since the labor income per hen is only $1.26 in the largest class, apparently as the result of the greater size of flock. Should a man wish to keep or develop a poultry industry of great size, it probably would be advisable to maintain units of a certain size, that is, about 2,000 fowls per unit or a flock each large enough to keep two men busy throughout the year.

## RELATION OF SIZE OF FLCKS TO FARM ORGANIZATION

In the average flock it required one man's time for almost two months to care for 100 fowls, and in small flocks 4.3 months, while in eight largest flocks one man cared for 100 birds in 1.6 months (table 8). When the man's time is reduced to money value, we find it cost $182.00 to care for 100 birds per year in the small flocks, while in the large flocks it cost but $65 or a trifle above one-third as much. The average cost per 100 birds was $81.00 per year for man labor. With such a great difference in labor cost per 100 birds for the large flocks, it should be much easier to make more money per hen. The larger flocks are far more efficient units for operation than the smaller ones.

Horse labor on these farms was relatively unimportant. Less than half of the farms had horses. There were seventy-five horses on 150 farms. Many farms had not need for horse labor except a small garden and patch for roots and green feed, such as cabbage. For this they could hire horse labor far cheaper than they could keep a horse and do it themselves. Around the Vineland area, many poultrymen took their eggs to the trolley car in wheelbarrows. This was the cheapest form of transportation found in the area.

The total value of equipment per farm increases, but not in proportion to the number of crop acres. The value of the equipment used for poultry alone decreased approximately 50 per cent on the larger farms. After a size of 700 to 900 fowls per flock was reached, the efficiency in the use of poultry equipment no longer increased to any apparent extent. As far as the use of poultry equipment was concerned, a flock of 701 to 1,100 was as efficient as or more efficient than any other size .

The building investment shows very much the same relation to size of flock as equipment and labor. The average value of poultry buildings per bird was $1.54. On the smallest class of farms this was $2.79, while on the largest it was $1.09 per bird, or less than half as great. When we usually find that the rate of depreciation on buildings is 3 per cent, the interest 5 or 6 per cent and insurance 1 per cent, or a total of about 10 per cent, we can appreciate the difference in the charge for building cost per hen. This would amount to about 27 cents per hen for the small flocks and 11 cents per hen for the large ones. This is a large item for overhead expense.

## RELATION OF SIZE OF FLOCKS TO RECEIPTS AND EXPENSES

All business will reach a point of diminishing returns, if increased indefinitely. Whether these poultry farms in the larger class are returning the largest receipt per hen might be questioned by the small flock enthusiast.

The egg production per hen as well as the egg receipts per hen are about the same regardless of the size of the flock. Consequently, the large flocks are not too large for normal production. The total receipts per bird are greater on the farms having a small number of birds per flock because proportionately more chickens are raised. These chickens were included in the inventory at the end of the year, and considered in the calculations the same as a receipt. The crop receipts are likewise somewhat greater. Another significant fact about these small flocks is that more old hens are kept over for the following year. Only one third of the flock is sold as culls during the year, while for the larger flocks about half are sold as culls. The poultrymen who have small flocks are endeavoring to increase their size and consequently sell fewer old fowls, as well as raise a larger proportion of chickens. Since more old fowls are kept over, it might be expected that the egg production per hen would be less, but this does not prove to be the case, as it is somewhat above the average.

POOR MANAGEMENT

This illustrates the waste of valuable time on the part of the farmer taking his eggs to market. Instead of a poultryman having to spend a lot of valuable time, which he should be devoting to his poultry work on his own farm, too many of them take as much time per week marketing a few eggs as the eggs are really worth. The poultrymen and the farmers in every community should organize themselves and have one wagon go over a certain route each day to collect all of the eggs on that route and give the producer a receipt for same. This picture also illustrates poor management on the part of the producer by exposing the eggs to the sun on a hot summer's day on a long drive over a rough country road. The eggs are in poor marketable condition when they reach the buyer, in too many cases. These are all points that must be given consideration and often mean the difference between success and failure, profit and loss.

## TABLE 11

### Relation of Size of Flock to Expenses on 150 Poultry Farms in New Jersey

| FOWLS PER FLOCK | Eggs | | Egg Receipts | | Cockerels and Broilers | | Old Fowls Sold | | | Pullets Sold | | Crop Sales Per Farm | Total Receipts | | Per Cent of Fowls Sold as Old Fowls |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Total per Hen | Used for Hatching and Table Per Hen | Per Farm | Per Hen | Number | Value | Number | Per Cent of Entire Flock | Value | Number | Value | | Per Farm | Per Bird | |
| 300 or less........ | 115.2 | 7.2 | $ 748 | $ 3.00 | 382 | $ 88 | 81 | 32 | $ 49 | 46 | $26 | $92 | $1,304 | $ 5.10 | 33 |
| 301 to 500......... | 109.2 | 4.8 | 1,293 | 2.90 | 478 | 110 | 192 | 40 | 122 | 51 | 26 | 93 | 1,883 | 4.20 | 44 |
| 501 to 700......... | 98.4 | 5.8 | 1,607 | 2.60 | 567 | 145 | 247 | 43 | 152 | 88 | 73 | 49 | 2,153 | 3.50 | 41 |
| 701 to 900......... | 101.9 | 4.7 | 2,185 | 2.60 | 613 | 147 | 357 | 49 | 259 | 60 | 38 | 56 | 2,855 | 3.40 | 43 |
| 901 to 1,100........ | 117.5 | 3.5 | 3,211 | 3.20 | 929 | 284 | 499 | 49 | 407 | 101 | 95 | 25 | 4,059 | 4.60 | 50 |
| 1101 to 1500........ | 108.6 | 6.6 | 3,842 | 2.80 | 1,032 | 234 | 576 | 42 | 371 | 98 | 125 | 26 | 5,082 | 3.80 | 44 |
| 1501 and over...... | 121.2 | 2.4 | 5,726 | 3.20 | 1,102 | 445 | 788 | 42 | 476 | 85 | 76 | 37 | 6,854 | 3.80 | 45 |
| Average........ | 108.8 | 5 6 | $2,100 | $ 2.90 | 636 | $166 | 314 | 43 | $209 | 70 | $56 | $62 | $2,818 | $3,820 | 44 |

## TABLE No. 12.

**Relation of Size of Flock to Expenses on 150 Poultry Farms in New Jersey**

| FOWLS PER FLOCK | Total Expense |  | Depreciation |  | Per Cent of Deaths | Feed-Cost |  | Per Dozen Eggs Sold | Amount of Receipts Above Expense Per Bird |
|---|---|---|---|---|---|---|---|---|---|
|  | Per Flock | Per Bird | Per Flock | Per Bird |  | Per Flock | Per Bird |  |  |
| 300 or less...... | $ 845 | $ 3.30 | $ 109 | $ .04 | 4.5 | $ 632 | $ 2.47 | $ .28 | $ 1.80 |
| 301 to 500....... | 1,236 | 2.77 | 140 | .03 | 4.3 | 896 | 2.01 | .23 | 1.43 |
| 501 to 700....... | 1,383 | 2.22 | 144 | .02 | 9.0 | 1,057 | 1.70 | .28 | 1.28 |
| 701 to 900....... | 1,724 | 2.04 | 143 | .02 | 5.5 | 1,329 | 1.58 | .20 | 1.36 |
| 901 to 1100...... | 2,251 | 2.20 | 165 | .02 | 5.4 | 1,712 | 1.67 | .18 | 2.40 |
| 1101 to 1500...... | 3,001 | 2.24 | 198 | .01 | 11.0 | 2,321 | 1.73 | .21 | 1.76 |
| 1501 and over.... | 4,097 | 2.26 | 215 | .01 | 7.6 | 3,038 | 1.68 | .18 | 1.74 |
| Average...... | $ 1,726 | $ 2.34 | $ 150 | $ .02 | 7.1 | $ 1,301 | $ 1.76 | $ .21 | $ 1.48 |

The average expense per flock on these farms was $1,726, while the average receipts were $2,828, leaving a farm income of $1,092 (table 12). In addition to this, the operator had his house in which to live. and produce for his own use from his farm.

The expense per bird was about the same after flocks of over 500 were reached. The expense per dozen eggs produced was about the same in a flock of 700 birds and above. The depreciation of equipment decreased up until 900-bird flocks were reached. In a flock of 1,000 or more hens, the profits were greater than in smaller flocks, because the business was of greater hize and not because it was more economical. The maximum efficiency of operation per bird or dozen of eggs produced was reached on the plant of about 1,000 birds. These plants could be increased to advantage until the receipts per bird decreased or the expenses per bird increased to the point where there is no longer any profit. The size of the flock where this would occur is not shown on these farms. Apparently no class had reached the size for maximum profits. Probably a unit of 2,000 to 3,000 birds would be about the most profitable.

## RELATION OF SIZE OF FLOCK TO INVESTMENT

When investing money in a business it is essential that the investment be made in such a way that it will provide for a large production at a relatively low overhead cost for buildings, equipment, land, etc. On poultry farms, the operator should have as large a proportion of his capital as feasible in poultry, and only sufficient in overhead investment as to provide for the proper care of the birds.

On the farms having the largest flocks 24 per cent of all the capital was in stock, while on the farms with small flocks only 11 per cent was in poultry. The average stock investment was 16 per cent. Since the poultry on these farms is almost the only source of income it is important to have as large a proportion of the capital in it as possible. Capital invested in buildings and equipment brings no returns; it simply provides the facilities for caring for the birds so that they will afford an income. Consequently, the poultryman's problem is to invest money so as to have adequate facilities for the poultry, without incurring an undue overhead expense.

## RELATION OR SIZE OF FLOCK TO THE NUMBER OF YEARS THE OPERATOR HAS BEEN IN THE POULTRY BUSINESS

All the foregoing data have shown that the larger flocks on these areas were the more profitable. If this is true, we might conclude that after a man had gained experience, skill and capital, he would increase the number of birds per flock.

As the poultrymen gain in experience and capital they increase the size of their flocks (table 14). Starting with a small flock, they gradually add to it until they have over 1,500 hens. This too is a good indication that a flock of 1,500 to 2,600 is about the most profitable for the farms found in the state.

## PRODUCTION

The number of eggs produced per hen is important in just the same way as the amount of milk per cow or the yield per acre is important in making a profit on the farm. This phase of the poultry industry has received more attention from poultrymen than any other. To accentuate its importance, egg-laying contests have been conducted in the various states, poultrymen have trap-nested their hens to find the individuals that laid the largest number of eggs, while different methods of feeding and housing have been studied to find the factors best suited to egg production.

## RELATION OF PRODUCTION TO PROFITS

Since the public has been giving so much attention to production we would expect it to be one of the big factors which influence profits in the poultry flock. At the same time, the poultryman does not always appreciate the full relation between the number of eggs produced per hen and the profits.

These poultrymen did not begin to make money until their hens produced 90 or more eggs per year. They then made about as much as a hired man could make. But above this point they began to make good profits. The men who sold 148 eggs per hen received labor income of $1,823. None of these lost money. There were only 16 poultrymen, or 10 per cent of the total, who obtained a production of 40 eggs (37 per cent) above the average production per hen for all the 150 farms. This average was 109 eggs of which 103 were sold. The average production in the state in 1909 was 67 eggs, according to the 1910 census. A large proportion of the eggs are produced by the farm flock, which is a minor enterprise or side-issue on most farms. In such cases the eggs are usually produced at a smaller feed and labor cost per hen, as many farm flocks are allowed to hunt the major portion of their living throughout the summer. Consequently, for a profit they need not produce so many eggs as a purely commercial flock. The production in a commercial flock should be not much less than 30 per cent, or 110 eggs per hen, in order to pay

**TABLE 15.**

**Relation of Egg Production per Hen to Labor Income on 150 Poultry Farms in New Jersey**

| EGGS PER HEN | Number of Farms | Eggs Per Hen | Eggs Sold Per Hen | Egg Receipts Per Hen | Hens Per Farm | Average Labor Income | Number with Minus Labor Income |
|---|---|---|---|---|---|---|---|
| 60 or less | 9 | 46 | 46 | $ 1.30 | 505 | $ 176 | 6 |
| 61 to 80 | 13 | 68 | 66 | 1.90 | 673 | 67 | 10 |
| 81 to 100 | 32 | 91 | 88 | 2.30 | 650 | 312 | 5 |
| 101 to 120 | 53 | 108 | 104 | 2.90 | 785 | 775 | 4 |
| 121 to 140 | 27 | 126 | 120 | 3.40 | 717 | 1,173 | 2 |
| 141 and over | 16 | 155 | 148 | 4.20 | 808 | 1,823 | 0 |
|  | 150 | 109 | 103 | $ 2.90 | 720 | $ 730 | 27 |

profits under normal conditions. This requires a well-bred hen that will respond to care and feed. At present, with the high price of grain, this should be about 120 or more eggs per hen.

The highest-producing flock found in the survey produced an average of 186½ eggs per hen. There were only 350 hens in the flock, of which 300 were pullets. The receipts for eggs sold were $1,935, or $5.83 per hen. This owner of this flock also sold 1,400 baby chicks at 12 cents per chick, amounting to $168, 150 yearling hens for $90, and 600 cockerels at 33 cents, amounting to $200, making a total receipts from these sources of $458. Besides this he raised 550 pullets. The total sales from poultry with the increased value of his flock at the end of the year amounted to $3,121, or $8.92 per hen, of which $5.53 was for eggs and $3.39 for chickens raised and sold. This man bought $1,106 worth of feed at a cost of $3.16 per bird.

## EXPERIENCE

Poultry farming presents a somewhat different problem. Feeding and caring for hens does not require quite the same kind of skill as plowing, pitching hay, driving a team and operating farm machinery. Consequently, this type of farming is far easier for the city man to acquire. A study of the history of these poultrymen informs us that most of them have entered the industry without previous experience. In the Vineland area, 40 per cent of those who took up poultry farming failed and returned to the city, while the other 60 per cent remained and were successful after a few years' experience. When we compare this with the proportion of failures in business in the city, it is not so large. It appears that poultry farming lends itself well for the city man who wishes to make a living in the country.

This is due to a number of factors:

1. Poultry raising is the type of farming that lends itself best to the inexperienced man in acquiring the necessary experience.
2. Less capital is required for poultry farming.
3. Poultry appeals more strongly to the city-bred man.

## RELATION OF EXPERIENCE TO PROFITS

About one-fourth of all the men who had less than six years' experience lost money, while of those who had eight or more years' experience less than one out of ten was losing money. (Experience was a partial insurance against failure.) The labor income of those who were in the business but one or two years was $362, while that of the men who had over ten years' experience was $1,344, almost four times as great. The capital was somewhat less for the men who were in the business but a short time. However, the difference was not great enough to make so large a difference in labor income. The capital invested per hundred birds was about the same until the men were in business over eight years when it increased.

The amateur started with a flock of 593 birds, and increased up to 1,075 after 10 years' experience. He has a larger proportion of pullets and a heavier investment in poultry buildings. Besides this, he tries to grow more crops. As the poultryman gains in experience, he tends to specialize more on poultry, exclusive of all else. He appears to find specialization the most profitable for his business.

The capital is increased with experience, but largely through the size of the flock of birds.

## PULLETS VS. YEARLINGS

Poultrymen usually recommend that the major portion of the flock be made up of pullets in order to be the most profitable producers. The hen lays a larger number of eggs the first year of her life than the second, and a larger number the second year than the third, decreasing the number each year as she grows older. The poultrymen of these farms keep a portion of their flock as yearlings and the remainder as pullets. The best pullets are kept the second year as yearlings and the inferior ones are sold. Those sold are selected according to the best judgment of the operator.

The most profitable flocks contained 50 to 70 per cent of pullets, Consequently, according to these data the flock to be properly balanced should have 30 to 50 per cent of yearlings.

## AREA OF POULTRY FARMS

Poultry can be kept in quite close quarters without much apparent injury to the egg-producing ability or vitality of the flock. Because of this fact, the man who wishes to invest but little capital in farming can buy a home with 5 to 20 acres of land, and after erecting his poultry building and laying out his yards and ranges, he is equipped for the poultry business. In spite of the fact that the poultry industry has been studied for years, we still have no data which show conclusively that a hen should have a certain amount of space for range or yard in order to lay the greatest number of eggs. The average size of these poultry farms was 11.6 acres. The smallest farm contained one acre, and the largest 150 acres. This is a wide range, but the most important point is to determine the area per 100 hens that is best for the production of eggs and the vitality of the flock. This might be expressed in terms of profit, eggs produced per hen, deaths per 100 hens or in other ways.

## RELATION OF AREA TO PROFITS AND CAPITAL

When expressed in terms of labor income or profit, there does not appear to be any area too small for the most profitable production on these farms. The farm having the smallest area per 100 birds had a greater acre value. This is largely true throughout the Vineland area where land values were greater than in some of the other areas. The operators of some of these farms were paying for location and buildings rather than land. There were 26 farms on which the farm area for their chickens averaged only 3.6 acres (table 28). In spite of their small area they had the largest income of all classes.

TABLE 28

Relation of Area per 100 Birds to Profits on 150 Poultry Farms in New Jersey

| ACRES PER 100 Birds | No. of Farms | Area Per Farm | Area Per 100 Birds | Crop Acres Per Farm | Capital Per Farm | Real Estate Value | | | Labor Income |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Per Farm | Per Acre | Per 100 Birds | |
| | | Acres | Acres | | | | | | |
| 0.5 or less........ | 26 | 3.6 | 0.4 | 1.3 | $7203 | $5473 | $1564 | $ 651 | $1056 |
| 0.6 to 1.0......... | 47 | 6.7 | 0.9 | 2.4 | 7128 | 5550 | 828 | 492 | 663 |
| 1.1 to 2.0......... | 43 | 11.4 | 1.5 | 4.6 | 7257 | 5541 | 489 | 745 | 743 |
| 2.1 to 3.0......... | 16 | 16.6 | 1.8 | 6.8 | 7532 | 5937 | 360 | 947 | 350 |
| 3.1 and over...... | 18 | 32.5 | 4.9 | 12.7 | 7293 | 5567 | 171 | 540 | 734 |
| | 150 | 11.6 | 1.6 | 4.6 | $7243 | $5572 | $ 480 | $ 756 | $ 730 |

The capital invested per farm was about the same regardless of the area. It appears that location and buildings are the major consideration in the purchase of one of these poultry farms. Close confinement of birds has not decreased profits or appreciably affected them. This is another advantage for the poultry industry, and should encourage the keeping of village and town flocks.

## RELATION OF AREA TO PRODUCTION, RECEIPTS AND EXPENSES

If the small areas of some of these flocks were injurious to the health of the fowls, we would expect a lower egg production, less receipts per hen and a larger percentage of deaths. If these factors do not decrease it would appear that 3.6 acres per 100 birds are sufficient to maintain their health, vigor and production under the soil and climatic conditions of the areas studied.

The number of eggs sold per bird is about the same regardless of the area per 100 birds, while the same is true of receipts (table 29). The flocks on the farms having the smallest areas are somewhat larger than on those of a greater area. One factor would indicate that these poultrymen are cramped for space when we study the price received per bird sold. Those on the smaller areas sell the young cockerels when three to six weeks of age, that is, as soon as they can distinguish them, for the very low price of 10 to 20 cents apiece. The poultrymen having larger areas kept more of them until older, when they were sold for broilers. If the space would have permitted, probably it would have paid all of these men to feed and fatten their own cockerels instead of selling them to someone else to fatten.

**TABLE No. 29**

**Relation of Area per 100 Birds to Egg Production, Receipts per Hen and Per Cent of Mortality on 150 Poultry Farms in New Jersey**

| ACRES PER 100 BIRDS | Dozens of Eggs Sold | | Receipts Total | | Number of Birds Per Flock | Value Per Bird Sold | Years' Experience of Operator |
|---|---|---|---|---|---|---|---|
| | Per Farm | Per Hen | Per Flock | Per 100 Birds | | | |
| 0.5 or less........ | 7274 | 8.5 | 3312 | 379 | 873 | $0.25 | 6.4 |
| 0.6 to 1.0......... | 6137 | 8.6 | 2705 | 374 | 721 | .35 | 5.4 |
| 1.1 to 2.0......... | 6368 | 8.8 | 2877 | 386 | 743 | .37 | 8.1 |
| 2.1 to 3.0......... | 5185 | 8.5 | 2360 | 376 | 627 | .28 | 6.3 |
| 3.1 and over..... | 5632 | 8.7 | 2667 | 403 | 661 | .47 | 7.9 |
| | 6338 | 8.6 | 2818 | $382 | 737 | $0.32 | 6.7 |

**TABLE 30**

**Relation of Area Per 100 Birds to Expenses on 150 Poultry Farms in New Jersey**

| 100 BIRDS ACRES PER | Total Expenses | | Feed Cost | | Labor | | Cost Per 100 Birds | Per Cent of Deaths of Mature Birds | Amount of Receipts Above Expenses Per Bird |
|---|---|---|---|---|---|---|---|---|---|
| | Per Farm | Per 100 Birds | Per Flock | Per 100 Birds | Months Per Flock | Months Per 100 Birds | | | |
| 0.5 or less........ | $1815 | $216 | $1488 | $161 | 13 | 1.49 | $61.70 | 6.6 | $1.6 |
| 0.6 to 1.0......... | 1685 | 236 | 1298 | 178 | 14.1 | 1.94 | 81.80 | 5.1 | 1.28 |
| 1.1 to 2.0......... | 1771 | 238 | 1343 | 170 | 13.8 | 1.86 | 78.30 | 7.3 | 1.48 |
| 2.1 to 3.0......... | 1635 | 260 | 1215 | 193 | 14.5 | 2.33 | 97.60 | 11.6 | 1.16 |
| 3.1 and over...... | 1567 | 237 | 1044 | 157 | 16.4 | 2.48 | 105.50 | 9.0 | 1.66 |
| | $1726 | $234 | $1301 | $176 | 14.1 | 1.92 | $81.20 | 7.1 | $1.48 |

The expenses in these flocks do not appear to be greatly influenced by the area of the poultry farm (table (30). The only item which shows any difference is that of labor. Flocks on the smaller areas are kept at a smaller cost of labor per bird. To some extent this would be influenced by the size of the flock, but the difference in size was not sufficient to make such a great difference in labcr cost. Evidently, flocks kept on a smaller area require less labor to care for them.

The death rate is not quite so great for the flocks on the smaller areas. If the small amount of range allowed these flocks were detrimental, it should show in the death rate. They were fully as healthy as those on the more extended ranges. For an area such as Vineland, diseases prevalent in one flock are much inclined to spread throughout the entire community because of the close proximity of these farms. This is a marked disadvantage for an intensive poultry district such as that of Vineland.

The feed cost per bird is about the same regardless of the area. Although there is some variation, it does not appear to show much, if any, difference due to difference in area.

From these data it appears that chickens can stand close confinement without injury. Probably the most serious objection to so densely populated a poultry section is the close contact of the individual flocks which makes the spread of contagious diseases dangerous. One of the most troublesome diseases in this section was chicken pox. The year of this survey the area was quite free from disease, while the following year the disease was quite prevalent. This made the death rate for 1915-16 lower than normal and gave an egg production about five per cent above normal. This disease is most prevalent in the late summer for about six weeks, when the production is cut to about 50 per cent.

## MAJOR FACTORS ESSENTIAL FOR SUCCESS IN POULTRY RAISING

A few pertinent factors were found to be very important in all the successful poultry farms. These factors in the order of their importance were as follows:

1. Size of Flock.
2. Egg Production per Hen.
3. Experience of Operator.
4. Proportion of Pullets to Yearlings.

For these farms the egg production per hen was less important than size of flock. All are necessary for success, but some more so than others. By dividing the farms into three classes, one class having over 720 hens and over 109 eggs per hen, one class having either of these factors (over 109 eggs per hen, or 820 hens per farm), and one class having neither of these qualifications, we cannot note the effect on profits.

## SUMMARY

1. The floor space in the laying houses was 3.9 square feet per mature bird.
2. Yearlings are largely kept every winter as breeders for the production of hatching eggs.
3. Few hens are kept after they are two years old.
4. The majority of the poultrymen buy their grains separately and mix them.
5. The ranges for the poultry occupy 3.2 acres per farm, or over 27 per cent of the total farm area.
6. White Leghorn fowls comprise 94.3 per cent of the total number on these farms.
7. These poultry farms received from products other than poultry an average of $62 per farm, largely from fruit.
8. The average labor income for the 150 farms was $730, almost $1 per hen.
9. The average capital per farm was $7,243.
10. The largest capitalized farms gave the largest profits.
11. The average per cent returned on investment was 15.1 per cent.
12. The average size of these flocks was 737 fowls, of which 720 were hens and 17 cockerels.

13. The largest flocks gave the largest profits per farm.

14. The largest flocks were the most economical to operate.

15. The average building investment was $1.54 per bird.

16. The amount of receipts above expenses, not including the operator's labor, was $1.48 per bird.

17. The average egg production per hen was 109 eggs for the year.

18. The average current expense per hen was $2.34.

19. The average receipts per bird were $3.82.

20. An average of 1.7 months' labor was required to care for 100 mature birds and chickens raised per 100 mature birds per year.

21. The flock with the highest production showed the greatest profit for the year.

22. Experience was quite necessary to success on these poultry farms.

23. The poultrymen on these farms were engaged in many different lines of work prior to entering the business.

24. The proper proportion of pullets to yearlings was 50 to 70 per cent of the number of the flock.

25. The size of the area per flock did not appear to affect the egg production, or the number of deaths in the flock.

26. The average depreciation of pullets was 29 per cent and of yearlings 50 per cent, while the average depreciation of a pullet until she was sold as a two-year-old was 64 per cent.

27. The average amount of feed required for the laying flock and young stock was 82.97 pounds per hen.

28. The average amount of labor for the laying flock and young stock was only 1.77 months per 100 birds.

29. The major factors essential for success on these poultry farms were: (1) size of flock, (2) egg production per hen, (3) experience of operator, and (4) proportion of pullets to yearlings.

30. The two most essential factors were size of flock and production per hen.

### QUESTIONS, LESSON 22

1.—What are the opportunities for a well managed poultry farm?

2.—What is scientific management?

3.—What are the essentials required in a successful poultry farmer?

4.—Are egg routes of any value? In what way?

5.—What value is there in community co-operation?

6.—Name the main accounts which should be kept by the average poultryman.

7.—What is the value of a system of accounting to the poultryman?

8.—What can you say of the feed cost, death rate, or profit on small areas as compared to large areas?

9.—What is the average depreciation on pullets, yearlings and two-year-old hens?

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## CHAPTER II

# Use of Artificial Lights to Increase Winter Egg Production

When a small boy upon the farm, my job was taking care of the hens. In winter months the hired man employed upon the place would visit the barns about five o'clock in the morning, for the purpose of feeding, currying and harnessing up the teams. For this purpose, ordinary kerosene lanterns were used, for the reason that it was usually two hours before daylight. A few stray hens and pullets had wandered away from the poultry house which had been provided for them and they found comfortable quarters in the stables. It was a noticeable fact that these few hens and pullets would leave their roosting places when the men appeared with their lanterns at this early hour, and they were down hustling around for feed while the men were doing their work about the barn. It was also a noticeable fact, when the eggs were gathered in the afternoon, that this dozen or so stray pullets or hens would lay more eggs in the mangers and hay-lofts than the two or three hundred hens which were kept in the comfortable poultry house. The reason, evidently, was due to the fact that these barn-yard fowls spent practically two hours a day more in the consumption of feed than the hens in the poultry house.

We had often heard of an occasional poultry man who had attempted to use artificial lights in order to increase winter egg production, but it was really looked upon as a joke and I did not have much confidence in the project, for the reason that this practice did not grow and come into more general use. However, I determined to try out this experiment for myself. Therefore, a few years ago I fitted a poultry house with electric lights, and controlled them with a clock which regulated the hours in which they were used. In two or three days' time the egg production began to increase. In two weeks' time I was getting a fifty per cent egg production when the temperature was sixteen below zero. This convinced me that longer hours would increase winter egg production in spite of cold weather, but at the same time I was also convinced that it is a very easy matter to over-do a very good thing. I turnel on the lights for several hours in the morning and again for two or three hours in the evening, and it was but a little while following that until half the flock had broken down. I over-taxed their systems and had quite a heavy mortality as a result.

I kept experimenting with different birds by using the lights, and my final conclusion was that it was best to have the lights turned on early in the morning and not use them at night, but let the hens go to roost at sundown as is their usual custom. The hens were ready to come from the roost at this early hour, and they made better use of the time between the hour in which the lights were turned on and daylight than they did if we kept them working all day and then expected them to work two or three hours in the evening. They were more or less sluggish during the evening period in which artificial light was used, and were inclined to want to go to roost. However, if a farmer or poultry raiser uses gasoline lights and finds it more convenient to use the lights during the evening hours before bedtime, he will find that this will give very satisfactory results. We hardly think it as advisable to use the lights an hour or two in the morning and again an hour or two in the evining, as it entails more labor and the results are not as good, as a rule, as where they are used entirely in the morning or exclusively at night.

In my opinion, the proper use of artificial lights to increase winter egg production, or to control production, is one of the most valuable things that has been discovered by poultrymen in recent years. If the florist wants chrysanthemums for Thanksgiving, or lillies for Easter, he knows just when to plant these and he controlled the heat and growth in his greenhouse in order to have them in full bloom on the proper day; if the dairyman wants his cows to be "fresh" at a certain season of the year, he knows just the proper time to breed them; but a great weakness of poultry husbandry has been our inability to control the season of greatest egg production. We have been forced to take the eggs when we could get them. When eggs were high and scarce, the hens and pullets were not laying and the poultryman had nothing to put upon the market. It has been found, however, that by the use of artificial lights a poultryman may produce the greatest volume of eggs during winter months. The reason for this increase is very natural and is not to be wondered at. The only wonder is that we did not reason it out and put it into practice years ago.

In order that our students may not only have our ideas and our recommendation as to the proper use of artificial lights to increase egg production, we quote the suggestions, ideas and results of other poultrymen. We are using lights upon our own farm and expect to continue the practice because we feel that it pays. This is a part of farm management which will increase the net profit at the close of the year.

Turning night into day for the hen may revolutionize egg production in the opinion of Prof. James E. Rice of Cornell University.

"The domestic fowl, by nature, is an inhabitant of a tropical country, born and brought up for centuries upon centuries in the neighborhood of the equator where the nights and the days are equal—twelve hours long the year round. The hen was built for that kind of climate. Her digestive tract and her reproductive system were put together to fit that tropical condition. When man discovered these hens, he brought them into the north temperate zone as unwilling captives, placed them in an entirely different environment and told them to "go to it"—to use a slang expression; and they did—in their own way. Instead of changing their nature to fit the new conditions, they changed their habits, which was the most natural thing to do. When the long, cold nights and short days of the fall and winter came on, they simply tucked their heads under their wings and waited until spring should come. They ceased laying and saved their energies to keep warm. Instead of changing the length of their intestines or the size of the feed hoppr—the crop—or gizzard in order to meet a fifteen or seventeen-hour night, they simply hibernated—that's all. They did exactly as the woodchucks do. That is, until they reached the environmental conditions in the north that were comparable to the original conditions in the tropics, these birds simply followed the natural course of events and the line of least resistance and rested.

"It would seem, therefore, that the real purpose of artificial light is to enable the fowls to eat when they can use the feed to best advantage in making eggs. It equalizes the time between meals as the hens' normal habits require.

"It is desirable to point out some of the proofs of the theory that has just been expressed and then give some of the figures and facts that will show that it is of ecenomic importance to understand these principles.

"The first fundamental fact is that the hen, by nature, is responsive to her environment. She changes her habits with a change of the weather, which is a change of environment. Doctor Simpson, of the Cornell Medical College, in co-operation with the poultry department, made a very large number of temperature tests of a large number of fowls in the college plant. As a result of that study he established the fact that the hen's body temperature fluctuates throughout the year very much in accordance with the radical changes in the air temperature. The tendency is for the birds to vary their temperature with the temperature of the air. This rule proved true with all our different flocks.

"We also learned how perfectly egg production correlates with body temperature and that when the temperature of the weather is low the temperature of the fowl is low and egg production is low. As the weather warms up, the blood warms up and egg production increases.

## CLIMATE AND EGG YIELD

"A more perfect correlation, however, was seen when we came to plot the hours of sunshine each day with egg production. The curve of egg production fits the curve of hours of sunshine. That gives the key to the situation. It is primarily hours of sunshine that determine the hours of eating, the hours of eating influence temperature of the fowl, and eating, air temperature and activity influence egg production. There is the chain of events in their logical sequence.

"We also see how well egg production fits climate when we compare the percentage of egg production of flocks of fowls on the opposite side of the earth, in Australia, with the same kinds of fowls on this side of the earth, in New York State, for the same months of the year. Flocks of fowls in Australia give their lowest production in April and May, begin to go up in June, continue to increase production until the highest yields are reached in October and November and begin to go down in December until the following April. Exactly the reverse of this was true in New York State. Our fowls reach their high yield in April and May, gradually decline through June, July, August and September, arrive at their lowest production in November, and start to go up in January, reaching their highest production again the following April. The relationship is so perfect that you find that in whatever part of the world the fowls happen to be, they respond to climatic conditions of the country.

"At the equator we find that the span of the day remains just about the same, with only a very few minutes difference month by month throughout the year—a twelve-hour day and a twelve-hour night. Take the opposite and greatest extreme section that is represented by sixty degrees north, at Petrograd, Greenland, Hudson Bay or in Alaska, and you find the shortest day on the twenty-first of December is between five and six hours long, which means that the longest night is eighteen to nineteen hours long. In other words, the farther north we go the more essential it is to have some means of artificial illumination to overcome the lack of sunlight in that particular place at certain times of the year. The farther south, the less important it is that we resort to artificial light to overcome a defect so far as meeting the ideal requirements of equatorial conditions for egg production.

"To test the effect of the longer day in the South I induced a friend who has been going to Florida each winter to take with him a flock of early hatched pullets and see what would happen. He did this and reported that he had never seen such high egg production. They laid just as well all winter long as they would lay here in the north in April and May. The next year it was suggested that he take hens that had molted early. He reported that those hens laid just as well in November, December and January down there as they would have laid in April and May up here. In other words the hens were ready for production and if they had stayed in the north, without the use of light, even by the best-known methods of feeding and careful housing he could not have gotten anywhere near so many eggs in the winter as the hens would have normally laid in the spring. When we get our hens into physical condition to lay in the fall instead of carrying those hens over until spring, we can put on the lights and get them to lay in winter when one egg is worth two in the spring. That is where we make out money from artificial lights

"One may say this is an imposition on the hens. It would not be an imposition to carry them back to the place which they are naturally fitted for near the equator, where the nights and days are of equal length. It is not an unkindness to hens to let them have something to eat when they get hungry, about three o'clock in the morning. During the long nights they get cold and hungry four or five hours before the normal feeding time the next day. By shortening the night with lights we can keep them happy. The happiest hen in the world is a laying hen, and anything that you can do to keep the hen's digestive tract working normally will help to keep her happy and productive.

## MORE EGGS WHEN THEY ARE WANTED

"When lights are used properly, hens will lay more eggs in a year than they otherwise would. They will lay a larger proportion of eggs when they are high priced and they will keep in better health as a result of distributing their egg production more uniformly throughout the twelve months, instead of massing their production and overdoing it in a very few months of the year. There is danger in the abuse of this method of control. It is like dynamite and must be handled properly.

"Now, there are three fundamental factors that have to do with the use of illumination. The light itself, the physical condition of the hen and the ration that is used. The physical condition of the birds—whether they are in a reproductive condition or whether they are in a dormant condition—is important. Hens differ in condition as to whether they are dormant or whether they are reproductive or pregnant. It will depend upon the maturity and the physical condition of the birds at the time illumination is applied as to whether we are going to get the results we want or not.

## MAY STABILIZE PRICES

"The third factor has to do with feed. The problem here is: Are our rations intelligently prepared to fit the particular physical condition of the birds as we find them at that particular time? We are going to know more in the next year or two on this score by a good deal than we know right now as to how to connect up, to vary the ration to fit the physical condition of the birds. And if a person does not make his rations fit the birds at that particular time he can't expect to get the best results either with or without illuminaion.

"So here are really three factors, and if all three factors are not right we can't expect to get the most perfect control of production.

"Results will profoundly affect the question of cold storage. Leveling production will level prices. The new process will cut off the high peak of excessive production in certain seasons of the year when eggs are cheap, and fill up the valleys of low production when eggs are high.

"We can increase very, very materially the proportion of eggs that are laid in periods of highest prices, and thereby vastly increase the money value of the eggs that hens lay in a year.

"That second thing that we gain is an increase in the total number of eggs that are laid in a year. That is based on the well-known fact that if you can secure a high egg yield in the season of adverse conditions of the fall and the winter and tide those birds over until the favorable normal season of production comes. the birds can go out on free range and get the benefit of the warmth of the sunlight. Then they will have a tendency to stand up and to hold up on their production. Large egg yields require that hens begin early and lay late. Artificial light enables them to do this.

"In other words, the same thing is true in the production of eggs as in the production of milk. How much this increased egg yield will mean depends upon many factors, particularly upon the value of the birds, but it will probably mean from a dozen to two dozen eggs at least a year that the birds are able to get out of their system that much earlier in life.

"By turning night into day for the hen we are going to be able to produce eggs at a less cost for feed, for two reasons: First, because they lay more eggs into which to divide the expense, therefore reducing the cost per dozen. I think quite as important is the fact that with the use of artificial light we have a tendency to enable the hen to work at a more uniform speed throughout the year. This will eliminate those periods of excessively high production and of forced dormancy.

"A fourth factor is that we do this with better health to the fowl. The proper use of lights connected with the proper methods of feeding of hens in the right condition is going to result in limiting and reducing mortality. It should also result in higher fertility and better hatching power of the eggs and longer life of the birds. Illumination is not a stimulant but merely enables the hens to perform according to their natural inherited tendencies by giving them shorter nights and longer working and eating hours.

"It does not follew. however, that artificial light might not be misused so as to create the opposite effect. Light might be the means of spoiling the birds' efficiency. It might be made a means of causing the eggs to have lower fertility and lower hatching power, just the same as improper methods of feeding in the spring of the year, when hens are laying the most eggs, might create disaster. It all depends upon our interpretation of the conditions and our methods of meeting them. Lights must be properly used, and our present studies and the experiences of the many pòultrymen who are using lights will, undoubtedly, soon show us the right methods to b efollowed."

## AMERICAN POULTRYMEN DESERVE THE CREDIT

Few poultrymen in this country have been more enthusiastic about their new discovery than has Grant M. Curtis. editor of Reliable Poultry Journal. In his new book on the subject, Mr. Curtis has this to say:

"It appears that to America, meaning in this case to the United States, belongs the credit of having discovered the practical use of artificial light to lengthen the work-day of the domestic hen, thus to enable her to eat and digest more food during the short sunlit days of the year; to convert daily a greater amount of food into eggs and thereby largely increase her yield of this staple product during the period of usual scarcity when eggs for human consumption invariably are high priced.

"After the average person gets used to the idea of the use of artificial light to increase egg production, the first or main prejudice commonly met with is that it is a forcing process; that it means overworking the hens and therefore must result, sooner or later, in an injury to them, or in their physical breakdown. The welcome fact is that this fear is groundless, or practically so. Like almost anything else this plan can be overdone, but it very seldom has been, so far as our investigations have gone and it is indeed surprising with what uniform success it has been used to date by all classes of poultry keepers, from the small plant back-lotter to the big commercial egg farms of the Pacific Coast and in half a dozen or more eastern states, all of which information will be found set forth in reliable form in the following pages:

"This use of artificial light to lengthen the work-day of the hen during the fall and winter months in northern latitudes of the United States, Canada, etc., is really a feeding problem, so to speak, not a case of 'forcing' the birds. Success, or good results, do not in this matter depend in any degree on condiments or on specially invigorating foods. The astonishing increases in egg yield are not even the result, primarily, of well-balanced foods, but are the natural and logical outcome of the longer work-day in fall and winter, the longer period in each twenty-four hours of the calendar day for the hen to eat, exercise, digest, function, and convert surplus food into eggs. That truly is the foundation of the matter, the 'why' of the welcome increase. Of course, the other contributing conditions should exist, in order to get good, better or best results, such as proper housing quarters, right care, correct feeding, the use of wholesome, well-balanced, egg-forming rations, etc., but even with all these factors present, if the 'day' is too short—is cut down to seven or eight hours out of each twenty-four, the organism of the hen simply cannot do, in this short period, what it is prepared to accomplish with ease in twelve to fourteen hours, if given a fair chance.

"Strange as it may seem to persons with whom this idea or method is new, the healthy pullet or hen that is in right condition physically, actually wants to lay at this time of the year—during the fall and winter months. It is the one thing that such a pullet or hen most desires to do. The spring-hatched pullet by this time has reached the period for reproduction and the hen that has come through the molt is possessed with the same idea. Neither of them has any 'thought' whatever of the market price of eggs for human consumption, or of filling the egg basket. What they specially wish to do is to respond to Nature's insistent demand for reproduction.

"But mankind literally keeps these birds in captivity—has taken them into northern latitudes where the fall and winter days are so short that these comparatively small creatures usually go unfed—unreplenished—fifteen, sixteen and in some cases as much as seventeen hours out of each twenty-four, while meantime they are in freezing latitudes and must fight against cold, for their very existence. As a rule, their one source of bodily heat, absolutely needed to sustain life, is from the chemical action of digesting and assimilating food; hence, in the short days of fall and winter they do not have a surplus of food to convert into eggs for reproduction purposes or any other use.

"Now that we have made this discovery, the reasons, the causes are all plain enough. What a pity it is that we could not have anticipated these facts long ago, reasoning from cause to effect, or from effect back to cause and thus have secured this welcome increase in egg production each year during the annual period of scarcity! Following are some of the noteworthy things that have been said and written quite recently on this phase of the subject—to the effect that the increase is sure to result from healthy, well-kept, well-fed hens by lengthening the work-day of fall and winter is a natural process, is a feeding problem, not a matter of forcing or overworking of layers."

In Professor Shoup's latest statement he says:

"The first trial of our artificial lighting of poultry was on a rather limited scale. During the summer of 1911 we had managed to raise some three hundred pullets in fireless brooders. . . . Our rule in those days, when the land had to be cleared, shingle bolts cut, and firewood made, was to do no work in the daylight which could be done just as well by lantern light. Cleaning the droppings boards was a job that fell among the lantern-lit class in the morning. This pre-daylight performance had the additional advantage of keeping the eggs much cleaner, as the birds would fly from the roosts clear to the floor without wanting to jump on the droppings boards and soil their feet.

"We had noticed for several days that quite a bunch of pullets would follow up the lantern and endeavor to find grain in the litter, and had on several occasions placed the light on the floor for a few moments just to humor the biddies, which of course were very tame because of frequent handling in the trap-nests. Time was precious, however, and the one lantern was needed to clean more coops before breakfast and to get the oats out of the sprouter and distribute them through the coops so that the birds could eat as soon as it was light enough.

"So, when in the course of a Sunday visit, our old English neighbor suggested, in a vein of humor, that we 'give the bloomin' 'ens lantern light to he'eat breakfast and supper by,' it gave us the necessary hint. We hung the lanterns (the brightest barn lanterns we could buy) in various places, both high and low, to the rear and to the front of the coop, shifting them three at a time to try out the different positions, and finally nailed up tin reflectors on the front foot-wide upright coop supports about two inches from the floor and hung one lantern in a place.

"We found it necessary to have the lanterns trimmed and lighted as early as three-thirty in the afternoons, our days were so dark. As a precaution against fire, the lanterns when lighted were left on the workbench fifteen or twenty minutes, to make sure the flame did not rise, blacken the chimneys and possibly come out of the top to the danger of adjacent woodwork.

"The birds were so evidently pleased with the new arrangement that we could hear them singing long after dark, and in ten days' time from the purchase of the lanterns we had the pleasure of informing our poultry news dispenser that our production was up to 200 eggs per day and the country was saved."

Prof Jas. E. Rice:—

In an address at Chicago, July, 1918, Pros. Rice made the following statements with reference to the fact that it is natural for a hen to reproduce eggs under right conditions if given the chance:

"In this country, fowls come into laying from south to north, much as strawberries come into bearing. In Australia and New Zealand on the other side of the equator, the reverse is true. Our hens, when cold weather comes upon them, instead of going into a dormant condition, will respond at once in the way of egg yield, to favorable environment. If we can duplicate or maintain suitable conditions as to bodily health, length of day, etc., they will go on producing. In our country this statement refers to production during November, December, January, and February, in the case of fowls that are old enough and that also are in proper condition, as to health and surroundings."

A year later, in one of two lengthy addresses (first of two) delivered by Prof. Rice at the Judging and Breeding School, Cornell University, Ithaca, N. Y., July 7-12, the speaker said, in introducing his subject:

"Heretofore, we have depended on the time of hatching, method of feeding, style of houses, etc., to increase egg production in the fall and winter or during the period of natural scarcity in this northern latitude, hence, the period of high prices; but in these efforts we have met with only moderate results. For many years I have felt that if we could give our fowls what may be called hothouse conditions, as used for example by the florist, we could get eggs any time we want them—any time of the year. Lately, two great contributions have been made to the method of securing more profitable egg production. One is the successful culling out of non-layers and poor layers from our flocks by the use of external characters and physical examination; the other is by the use of artificial illumination to increase the length of day during which the would-be layers, the ready-to-lay birds can function and produce.

The principles involved in our use of artificial illumination are not mysterious. On the contrary, they are quite self-evident and easy to understand. For example, it is easy to realize that the domestic hen, when kept in this locality, meaning central or northern New York, is out of her natural habitat and she is held here in what amounts to captivity. This fact hardly needs discussion. We know that the original domestic fowl was a native of the tropical zone and climate. For centuries, for ages, she was accustomed to practically a twelve-hour day and a twelve-hour night, on the average. These birds, having been developed under those conditions, possessed organs that were based on at least twelve hours of daylight, meaning in particular their digestive organs. Man picked up these fowls and carried them north to points like Ithaca, N. Y., where during five or six months of the year they have, on the average, a nine-hour day and a fifteen-hour night, also vice versa.

"When brought north these fowls were limited in choice as to what to do. About the only chance they had was to go on functioning the best they could and, as time passed, to adjust themselves slowly to the changed conditions of climate, length of day, etc. Such adaptations mean slow progress. Springtime breeding was continued, with little or no attention to winter egg production. These birds from the south simply adopted new habits, but did not change their physical form. When winter arrived, with the long, cold nights, they tucked their heads under their wings and ceased to lay till spring came with its longer days and warmer weather. They just hibernated or practically so, and waited for more favorable conditions.

"First—and until recently—man relied mainly on feeding and special breeding to get these hens to lay in the fall and winter. Good housing and proper feeting will help. also breeding for egg production, based on vigor, high individual records, etc., but the response to all these efforts was not enough—did not make the keeping of layer-flocks on a commercial basis a profitable venture during the short-day period of the year, from September 1st to the following March 1st. taking the North Temperate Zone as a whole."

## A REMARKABLE, A REVOLUTIONARY DISCOVERY

"Here we have a remarkable, a revolutionary discovery or advancement in poultry culture. If it is as good as it seems, and I believe that it is, we can afford to proceed carefully, within reason. Such results as these hens and pullets have given us under lights—especially where the lights were turned on at three A. M., are absolutely astonishing. They seem 'too good to be true,' and yet this table is accurate; these results are ACTUAL, and I think you will agree with me in the use of the word 'revolutionary' in describing such remarkable production. What the results might have been if these fowls had been truly high producers, consisting of birds-bred-in-line for prolific egg yield, I am not prepared to say. Naturally, we ought not expect more than one egg a day per hen, hence, the financial benefit to the average poultryman in the use of lights will be greater per bird from average layers and moderately good layers, than from the really high production individuals. Yet, no doubt, by 'lighting' our birds during the short-day period of each season, we can get the maximum supply of eggs two, three or four months earlier, as compared with past achievements, and these excess eggs in the fall and early winter will bring us twice the amount in cash, which to date has been about the general rule, where lights have been used without average jurgment."

"More exercise, more feed—especially dry mash—more water by almost treble, and there follows these results: Better health, strongr constitution, greater strength, and, lastly, the logical end of it all, namely—FAR GREATER EGG PRODUCTION."

## SUCCESSFUL WITH BACK-YASD POULTRY

In most all cities and small towns, each residence and suburban farm is equipped with electric lights or gas. This being true, it is a very easy matter for a city lot poultryman to have a small colony house in his back yard and have two dozen or more good pullets in same. A strong electric light may be placed in the poultry house. A switch can be placed on the interior of the residence. This will enable the city lot poultry raiser to turn on the lights when he first arises in the morning and he can switch them off the last thing before retiring at night and never be forced to go to the poultry house unless he desires to do so. A city lot poultryman, who thus equips his poultry house can feed his table scraps to his hens and produce more eggs in winter months than he really needs for his own use.

As regards back-yard poultry keeping and the profitable use of artificial lighting, special attention is directed to the reports by Warren V. Clarke, Buffalo, N. Y.:

"The 'secret' of the heavy winter egg yield that I obtain is the use of electric lights night and morning, thus giving the chickens a longer day in which to consume food. I find that you can feed them less concentrated food by elongating the day. Of course, no success can be attained unless the fowls are given reasonable care, the proper kind and quality of food, plenty of drinking water, and suitable quarters. These conditions would insure the health of the fowls It is, of course, highly desirable that the birds you keep should have been bred for egg production.

"The lights are turned on at 5:30 A. M., and switched off at 7:15 to 7:30 P. M. Of course, as soon as the daylight is strong enough they are switched off until three or four in the afternoon, depending on the brightness of the day. The lights are used from October 1st to April 1st, with pullets, but with yearlings or breeders, they are used from August to February 1st, the hens being rested during February and March so the eggs will hatch well during the rest of the spring and early summer.

"Another advantage in using electric lights is that the chickens can be attended to after supper for the following day. The grain feeders and mash hoppers can be filled, likewise the non-freezing water founts. The only labor, which is a pleasant task, is gathering the eggs."

## A SURVEY OF RESULTS OBTAINED BY PRACTICAL POULTRYMEN

"Nothing has been more misinterpreted in poultry management than the use of artificial lights to increase egg production during the wintertime season of long nights and short days," is the statement of Prof. Victor G. Aubry, of the New Jersey Experiment Station, who made a survey of poultry farms in his state where artificial lights were being used as a means of increasing egg production.

"One is naturally surprised that it is not a more common practice, since its results are so productive, and it's no wonder that the average poultryman or reader is skeptical and feels at the best that there must be a 'joker' in this practice, when he finds that many years ago it had been repeatedly tried and almost universally rejected after a short trial. The average man feels that even if these beneficial results are actually realized, there must be a reaction somewhere, and the more extreme the results, the more convinced he is that this condition is actually so. In other words, he believes that it's a case of 'robbing Peter to pay Paul.'

"In order to clarify these matters from a sound angle, we must first acquaint ourselves with some actual results from flocks upon which artificial lights have been used. The following figures are taken from almost 4,000 hens in fourteen different flocks kept by fourteen different poultrymen, most of whom had to be convinced of the results of this practice as few of them had ever before used lights. I can't emphasize the fact too strongly that in large numbers like this, and under these many conditions, the results are true averages and results which one may expect when using these lights. One cannot say that these beneficial results are only an accident and may not another time be made. Not only should these results be what one might expect because large numbers are included, but in these fourteen flocks all types of poultrymen are represented, from the keeper of backyard town-lot flocks and the farm flock to the large commercial flock and the highly specialized poultry breeder's flock.

"Furthermore, these results are about the average of results obtained from flocks at different experiment stations, and results universally reported from many other flocks all over the country. We are then, I believe, safe in assuming that from a dollar-and-cents basis, this is certainly a practice to be recommended."

## THE EXPERIENCE OF H. RAPP

"Over in the eastern end of Monmouth County, New Jersey, H. Rapp is looked upon by his neighbors as one of the solid men in the poultry business. He has been over there keeping poultry for a good many years and has studied the problem from all of its commercial angles. A number of men who started in his neighborhood have sooner or later come to adopt many of his ideas and practices. Most of them have his stock either directly or indirectly, and so no better man could have been found to try artificial illumination in that neighborhood than Rapp. He had always, of course, wanted one of the farmer's electrical unit plants, but had never quite felt justified in laying out the money for it until late last summer, when he took the pretext of using lights in his hen houses as a reason for installing his plant. Rapp felt at this time that at the best it would be quite a number of years before the increased production he got from his birds would pay for the extra installation of his lights. After trying it out, however, on about five hundred pullets last fall and winter, he has become so enthusiastic that he told me the other day it was the biggest step ahead that poultrymen had taken in the past ten years, and that he expected to see the use of lights on layers as universally practiced in this state as the use of dry mash, or fish scrap or meat scrap in dry-mash feeding.

"Rapp has maintained better than fifty per cent production on some of his flocks from October right straight through the winter and clear up into spring or during the flush egg season. During December he averaged sixty-seven per cent production from one of his flocks under lights, and has already realized, due to the fact that eggs are high-priced at this time of the year, more money per bird from every bird under lights than he ever did from any flock for twelve months of the year; and even though his birds had stopped laying entirely from April on, he would have realized just as great a return from them as he did in the past years from his flocks which laid right through.

"Here is a case in many respects directly the opposite of Rapp's, because the man is a beginner and has had only about two years' experience. Mr. Faure, located in Cape May County on some of the poorer soils, bought his sixty-acre farm for practically a song. During the past two years he has developed this place so that he carries about a thousand birds. He has ideas of his own in poultry-house construction and, although they can be criticised in many ways, they have a good many practical features especially since he has reduced the cost of installation to less than a dollar a bird, as compared with the average of the state of New Jersey of about two dollars. This man, although a beginnre, is aggressive, and is willing to do anything if he can be shown that it will mean a profit in the end. When the theory upon which artificial illumination is built was explained to him, he installed one of the electrical units and used it on his hens as well as on pullets. On the pullets the lights were begun early in the fall and on the hens only after the first of December, or after they had gotten a short rest from their molt.

"Since Faure had no birds that were not under lights, the comparison of his production with what he might have received had the lights not been used was made instead with the average production of the average flock in the State of New Jersey. Taking these figures, Faure more than paid for the $450 cost of installation of his electrical unit from the extra eggs he received from his hens before Christmas. During September with the lights on 450 pullets, he got 5,401 eggs, or a production of about forty per cent. During October his production increased to forty-five per cent, which gave him 6,278 eggs. During November, he hit fifty-two per cent production, and realized 7,026 eggs from these birds. During December they held up to fifty-one per cent, which gave him nearly 7,000 eggs again. It was on the first of December that he started the lights on his 450 hens. They were laying at that time about five per cent. Before the end of December they were laying better than forty-five per cent, and averaged for the month thirty-three per cent, which gave him 4,603 eggs. The difference in this production and the production which is received from the average flock in the state not under lights, eggs averaging for these months about seven cents apiece or eighty-four cents a dozen, brought the amount to over $600 more than the average return from the same number of birds not under lights. Since January his flock maintained approximately a fifty per cent production to June and were at that time going as strong as the average flock in the state.

"Faure wrote as follows to one of his friends· 'I put in a farmer's electric light system last fall which cost me over $400, and I more than paid for the entire installation from the extra eggs I received from my 900 birds before Christmas.' On December fourteenth he wrote me as follows: 'You will be interested to know that Mrs. Faure just came in with a five-eighths basket—five-eighths of a bushel—chuck full of eggs, and that it is only one o'clock in the afternoon. I am going out and get some more later.'

"One may think that these results can be obtained by the use of electric lights only, but we have more poultrymen included in this lot who have used gasoline lanterns than electric lights and some of their experiences will be of interest. On a flock of early March-hatched pullets in Ocean County, these lights were started the early part of March. The poultryman had for years been hatching part of his pullets late in February or early in March and, though he had always received a good lay from these early hatched birds from August on into the winter, they invariably molted pretty heavily sometime in November and December, depending upon the kind of a winter which happened to prevail. About fifteen hours of daylight, including both artificial and natural daylight, were used on these birds from the first of September on. They started to lay as usual in August and have continued to lay approximately fifty per cent production from the early part of September to the present day. They have shown absolutely no signs of molting and were, during the middle of June, as nice-looking a flock as a man would want to see.

### A BOOSTER

"Henry Heine, who owns this flock and who has developed his poultry farm from a flock of about fifty birds a few years ago, to over 1,200 at the present time, and has increased his plant by using only the money made by the flock, has ridden over and survived the rough seas of developing a poultry plant, and is naturally in a position to judge. After seeing the results of these gasoline lanterns on this early hatched flock of pullets, he installed it later in the fall on his April and May-hatched flocks, with equally good results In talking to Mr. Heine about artifical illumination, he said:

'My birds—both the early and late hatches—in October, November and December, looked very much the same to me as they usually did along in March and April. In other words, during March and April practically every bird in the flock is busy working and laying, with a heavy-developed comb, and the flock looks fine. My flocks in October and November usually looked quite irregular, some birds showing full production with heavy combs and dilated abdomens, while others, although they seemed to be in perfect health, showed that they were not in production. This past fall, with these birds under lights, they were all well developed. This condition, of course, had to be, because I got about a fifty per cent production during the fall and winter, showing that practically every bird was laying. I certainly cannot see how commercial poultrymen in New Jersey from now on can afford to do without lights.'

'Mr. Heine also expressed the feeling of many others who had used these gasoline lanterns when he said they were absolutely satisfactory. They are not at all dangerous, as most of them have been approved by fire insurance companies, and when one examines one of these lamps and sees how they operate, he can readily see the danger of fire is almost entirely eliminated. They are economical to operate and certainly give an extremely good light for the birds. About one of the ordinary size lamps is used over a hundred birds.

"Way down to the other extreme of using artificial illumination, we find a few who have used the ordinary kerosene barn lamp, putting a reflector on the back of this lantern, and using about three lanterns to every hundred birds. John Cray, of Hunterdon County, used these kerosene lanterns, starting about the middle of October.

"Inside of ten days he had doubled his production from twenty per cent to about forty per cent. Although he intends to install either gasoline lanterns or an electric light system this fall, he is emphatic in stating that even though he could not get anything but kerosene lanterns to use in his hen houses, he certainly would not do without them during these seasons of long nights and short days.

"From the experiences of these men and from the observations made, it does not seem to matter what kind of a light is used, provided the birds have enough light and provided the time the lights are used is not overdone. As good results have been obtained where kerosene and especially gasoline lanterns have been used as where electric lights have been installed, although, of course, the latter are a great deal more convenient and have much to recommend them in many ways. But just because one is not in a position to use electric lights is no reason for not taking up this practice. The poultryman will find it a great deal to his advantage if he will install either the gasoline lanterns or kerosene lights.

## BETTER HEALTH

"These flocks, as a whole, showed much better condition of health than did the birds not under lights, and although in most pens the lights were discontinued by April first, these hens are laying today about the same number of eggs as the birds which have not been under lights.

"The practice of artificially lighting hen houses has shown without a shadow of a doubt that it will materially increase fall and winter egg production, and has very little, if any, influence on the egg production of spring and summer which follows. It has also been shown that it is not a forcing or so-called burning-up of the hens, but is rather giving the hens an opportunity to do not only what they should, but also what they seem to be anxious to do.

"Of course, a test over several years may show some other effects. The breeding of the hens may be influenced. However, the objections must be great to offset the beneficial effects, as so far discovred."

## SUMMARY OF THE SURVEY

"Nothing in poultry keeping is being discussed more today than the use of artificial lights in poultry houses for the purpose of shortening the long nights of fall and winter, with the object of enabling birds to feed

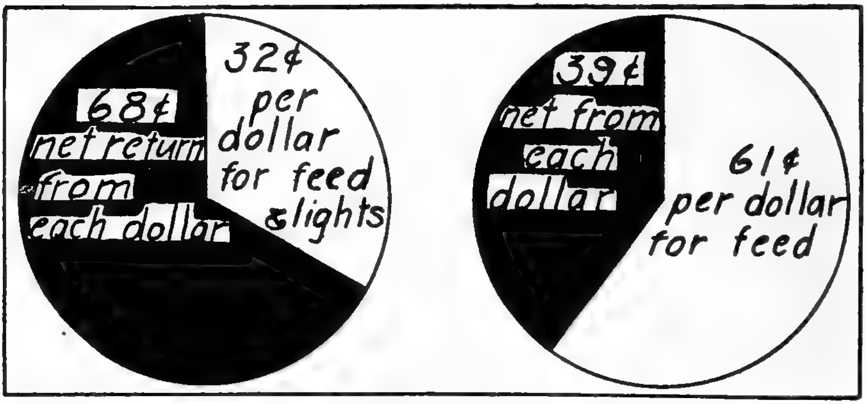


FIG. [illegible]—[illegible] OF "LIGHTING SYSTEM" IN NEW JERSEY

These two circles show the financial benefit of the use of artificial lighting on fourteen flocks of layers (small and large) in New Jersey, September 1, 1918, to March 1-15, 1919. Where lights were used the egg yield was increased to such an extent (average for the fourteen flocks) that 32 cents out of each dollar of the receipts paid for the feed and lights, leaving 68 cents out of each dollar as "net return" above cost of feed and lights; whereas, if lights had not been used and only the average egg yield for similar flocks "not lighted" (same six months) had been obtained, it would have taken 61 cents of each dollar of receipts to pay for feed, leaving but 39 cents as "net above feed cost" from each dollar of receipts.—Courtesy of Victor G. Aubry, Extension Specialist, New Jersey Agricultural Experiment Station.

better and consequently to lay more eggs. At the same time probably nothing is more misunderstood than the effects or results of this practice. Many have a belief that there is something about the lights that stimulates production. This belief is erroneous.. The lights are a means to an end, and the real factor, or the cause of the effects on egg production, is a matter of FEED. On this point many believe that this means forced feeding. This also is a wrong conclusion, as it is not a case of 'pushing the hens to the feed,' or of cramming it into them, but simply is giving them the opportunity to consume the amount of feed which they WANT and which they NEED in order to maintain a fairly good production during these seasons of naturally low egg production.

"Because of these reasons, let us not forget that this practice is in no way a matter of forcing our hens in any manner or form, but instead is a practice which allows the hen more easily and more surely to produce fall and winter eggs which we so much desire and, in fact, which we are almost obliged to get in order to realize the income that we must have.

"This will deal briefly with the most approved methods of using these lights (at least for New Jersey conditions) on birds which are going alone, and not for the purpose of breeding.

"Artificial lights is being tried on breeding stock and young stock with excellent results to date, this practice on these birds has not developed far enough to warrant as yet, a general recommendation. But on birds held for egg production alone, it has more than been satisfactorily proven, time and again; in fact, the results as tabulated near the close of this circular are only representative of hundreds of others all over the country and at a number of Agricultural Experiment Stations. It can be said that it is the rare exception to find results which are negative or adverse to those here given, and the author, although he has seen many flocks so treated and has received and heard of the results of many more, has yet to hear of a single negative result.

## SEASONS DURING WHICH IT IS MOST EFFECTIVE

"Any time from September 1st until April 1st will be found to be effective in New Jersey. Even in extreme cases where these lights were not used until late in January and in February, the results were effective inside of a week or ten days from the start. Of course, during these seasons, egg production almost invariably is on the rise normally, but the results noted showed a more rapid increase than the normal.

"It must not be forgotten that the object is to shorten the long nights of the fall and winter, however, and that therefore the sooner in the season it is started, the better. This is so to the extent that just a few days will mean quite a bit. We find some who would not use lights on pullets until they had started to lay of themselves, with the idea that this would force them to premature production and stunt their development. This is wrong, as a bird **will not lay** until her body is so developed as to be able to manufacture eggs properly. These lights, however, hasten this development to maturity and in no way are they harmful.

"Another idea which often holds up the use of lights early in the fall is the fear that if the birds are started too early in the fall, they will react during the winter, that they will stop laying and often throw a molt. Don't forget that this reaction and molt often happens to flocks which have started late and is no doubt due more to improper feed, to improve growth of pullets or to some adverse condition of weather, than to the fact that they have already laid **too many eggs**. A few flocks noted in the tabulations which follow are February and March-hatched pullets, and to date those that have not suffered from chicken pox or colds have not let up in their production since last August, having shown no molt, and they are doing fine.

"The lights should be started on or soon after September 1st, at least for New Jersey. For the different aged pullets, differences in feeding should be practiced, as is noted later. After March 1st the effect of lighting is very slight and for New Jersey conditions their use could well be stopped between the 1st and 15th of March.

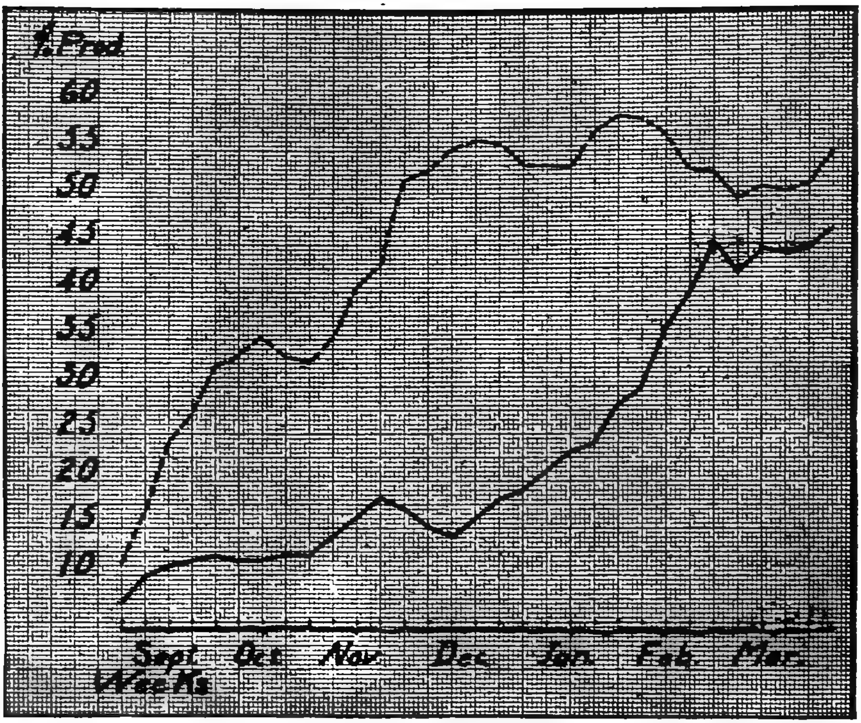


FIG. III.—USE OF "LIGHTING SYSTEM" IN NEW JERSEY

The interested reader, on noting Fig. II herewith, naturally will wonder why there was a decrease in egg production under lights the last two weeks of October and the first week of November, 1918; also from December 1st to the middle of January following. This was caused by chicken pox in several of the 14 flocks, which affected the pullets in October-November and both the hens and pullets in December-January. This diagram (Fig. III) shows the egg production (dotted line with lights and solid line without lights) during the same six months, as made by three of the fourteen flocks that did not have chicken pox. Note the much larger yield proportionately of these three flocks (on a percentage basis) and their consistent production "under lights."

## TIME OF DAY AND AMOUNT OF HOURS TO USE LIGHTS

"As far as the birds themselves are concerned, it doesn't seem to matter much during which part of the day the lights are used, although it is sometimes difficult to keep the birds from going to roost while the lights are still burning if used entirely in the evening especially if run late, after 8:30 or 9:00 o'clock, and when lighted late, it often requires a bait method of some kind in the feed, like scratch feed or a warm mash, just before closing time. Very good egg yields, however, have been realized when lights were used all in the evening, also when used all in the morning, and also when used part in the evening and part in the morning. I believe, therefore, that the poultrymen on this point may well adapt time of use to his own conditions and convenience.

"Although in just which part of the day these lights are used does not seem to be so important, the length of time they are used does very materially affect results, and one should plan his time accordingly, so that the birds will get as near as possible a uniform length of day. From 14½ to 15½ hours seems to be the best length of day. This, of course, includes the normal daylight hours. For example, if natural daylight starts at six A. M. and darkness comes so the birds go to roost at seven-thirty P. M., then either one whole hour of lights should be given in the morning before daylight—that is, at five A. M. the lights should be turned on—or an extra hour at night, when the lights should be started at seven-thirty and shut off at eight-thirty. Otherwise half of the extra hour should be given in the morning and the other half at night. This would give the birds a total of 14½ hours of daylight. One more hour could be given with good results, but over the 15½ hours has not been found to be good, as it seems to tire the birds and they do not seem to want to make use of it.

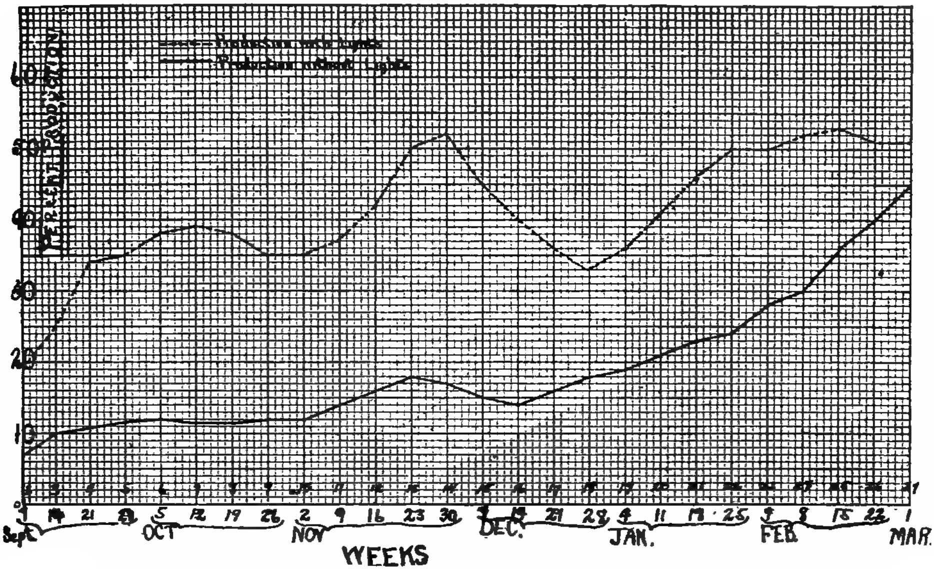


FIG. II.—USE OF "LIGHTING SYSTEM" IN NEW JERSEY

This graph or diagram illustrates Table No. I, as compiled by Mr. Aubry, for the July, 1919, issue of "Hints to Poultrymen," as published by the New Jersey State Agricultural Experiment Station, New Brunswick. For this table complete, see article herewith. Graph shows results of lights on 3,940 birds, "kept in 14 different flocks and cared for by 14 different poultrymen," from September 1, 1918, to March 1-15, 1919, as reported weekly to the State Poultry Department, New Brunswick. Per cent of production is shown in left-hand column of figures. Dotted line shows actual production, week by week, made by the fourteen flocks under lights, while solid black line shows average production during the same period by practically 10,000 birds in New Jersey, kept under similar conditions but without lights, as reported at regular intervals to the Poultry Department at the Agricultural Experiment Station. Reports received, figures compiled and this graph made by (or under the direction of) Mr. V. G. Aubry, Extension Specialist, Poultry Department, New Jersey State Agricultural Experiment Station.

"Under this system one must gradually vary the time of starting his lights in the morning, or of shutting them off at night, according to the shortening or lengthening of the natural day. Where night lighting is used, some way of gradually shutting off the lights is generally used so that the birds can see to go to roost and will not find themselves on the floor in the dark on a moment's notice. With electric lights, dimmers or two switches are used, one turning off most of the lights and the other just a few which will allow the birds to see to go to roost. With gasoline lights, they are turned off and most of them take time enough in going out to allow the birds to go to roost. Gas lights are turned down gradually, as also are kerosene lights. When used in the morning, these arrangements of course are not necessary, as the lights in this case are turned on full blast and kept there until natural daylight is sufficient to warrant turning them out. It has been found that with electric lights if one will snap them off and on a few times just before the time to turn them off for good, the birds will of themselves go to roost with full lights on, making it unnecessary to use dimmers, etc. This can be explained by the fact that after the fifteen hours or so the birds are ready to go to roost anyhow, especially if a good scratch feed is given the last thing at night.

"The following schedule has given, it seems, the best satisfaction of those tried, especially to the poultryman himself, as it has not interfered with his going to meetings and out on pleasure in the evening:

"Starting the lights at 4:30 in the morning, until natural daylight.

"Starting lights again as it gets dark in the afternoon (this time varies on dark and bright days) and shutting them off at 7:30 in the evening. Once the natural day has gone over this time the lights may be discontinued.

"These hours are given on the "old time" schedule and not in accordance to the new daylight saving schedule as used during the last two years.

"When the lights are used either all in the morning or all at night it makes it quite inconvenient to the poultryman during December and January, especially when the days are extremely short, as it obliges him to either start lights around 3 A. M. or to stay up until around 10 P. M.

## KIND AND AMOUNT OF LIGHT

"Any kind of light from kerosene to electric light has been found all right, provided the birds have no difficulty in seeing. The electric light, it goes without saying, is the most convenient and least dangerous as to fire, and in most cases is as cheap as any in the end, although where electric lights are not obtainable, some of the types of gasoline lamps have given excellent satisfaction and are cheap to run. Most of them are safe from fire danger, having been underwritten by fire insurance companies. The prices of these lamps run from five to fifteen dollars each. Ordinary kerosene lanterns, if enough are used and if a good reflector is placed back of them (and of course if kept clean) have done well. One should not ignore this system or turn it down because of difficulty in getting lights. The cost of the gasoline lantern is made up many times in a short while by the extra return on eggs, and some poultrymen, during the past year, have even more than paid for the installation of one of the farm electrical units costing about $400.00, doing this on extra eggs alone, and before the season was quite half over.

"The light that corresponds to a 40-watt electric lamp is the least that should be used for about 100 birds, and 80 or 90 watts or even more will be found still more profitable. Usually one of the gasoline lanterns and four or more barn lanterns with reflectors will do, although here again more is better than less.

## FEEDING BIRDS UNDER LIGHTS

"Feeding under this system is very much the same as it is under ordinary management, but nevertheless there are certain important details that should be observed, which will help a great deal to make this system more successful. As stated before, the significant factor which affects our birds is one of feed. During the short days and especially the long nights, which are on the increase until the latter part of December, a large majority of our birds get very little more feed than enough to maintain body heat, to rebuild broken cells and to function properly the various organs. Consequently, of course, they have difficulty in producing eggs, and it may be said that some do not even get sufficient food for maintenance, which condition causes a large proportion of our winter troubles. Some hens, as shown by the trap-nests, are heavy winter layers, often laying as many eggs during the six months of fall and winter as they do during the balance of the year, and doing this without lights. This condition is explained by the fact that these hens are exceptionally efficient utilizers of food material and waste, so that they pass off a minimum amount of food in the droppings. Such hens are exceptional, and as shown by the average low-flock production during these seasons, the average hen wastes or passes off in her droppings much more food material, thereby not using efficiently the short ration which she must necessarily get during the season of long nights. This means that the average hen does not get sufficient nutrition to manufacture eggs during the fall, and especially during the winter.

"As is true of other animals, no two hens assimilate feed in the same degree of efficiency, and there is also no doubt a wide variation as to the actual amount of nutrition necessary for maintenance in different hens. The size of the hen and without doubt numerous other factors, influence this character. So the natural winter layer is the hen that so efficiently utilizes her feed as to allow her enough of a surplus over maintenance to make eggs, whereas the average hens are only able during these seasons to maintain themselves, with the same opportunity to get feed.

"The artificial lighting, therefore, will only affect the extra good hen insofar as it gives her more opportunity to stay within the amount of food she needs, for even they, without doubt, are often close to the edge of starvation as far as egg production goes and often fall off in production when weather conditions are unfavorable. This will not affect such a hen's production much. But this system is most effective on the average and poorer hens, as it gives them the chance to get the surplus feed needed for egg production. It accordingly then does not force them, but gives them the opportunity which they seek.

"The mash feed should be fed dry and in boxes or self-feeders kept constantly before the birds and available to them at all times. This system of feeding mash may be supplemented by feeding the same mixture wet and given the last thing before going to roost, or during the middle of the day. But only enough wet mash should be given so that they will clean it up in half an hour at most. (This is important, as they usually get sick of wet mash if it is left before them any longer.)

"The scratch feed should be given at least three times daily and in real cold and disagreeable weather may well be given four times. The amount of mash the birds will eat will be influenced greatly by the amount of scratch feed given, as they will consume a large part of their daily ration in the form of scratch feed if enough is given. Therefore, only a small part of this scratch feed should be given in the mornings and is more for the purpose of exercise than anything else, and it will be found that they will work and scratch as hard for one pound of scratch as they will for ten pounds. When given too much, they will only eat that which they find on the surface of the litter and then will be more or less satisfied and will not dig for the part that sifts through to the floor. A good big feed of scratch should be given at night, because if they can be made to go to roost with a crop full of scratch feed, it will last them through the night much better.

"On late-hatched pullets this schedule of feeding scratch feed should begin just before it is expected the birds will or should come into laying, or after a few eggs are found in the pens. Before this time, for about three weeks to a month, these pullets should be fed quite heavily on scratch feed. This will enable them to come into production with a good reserve of fat and in good condition, a matter which is quite important for the steady winter egg production. By a heavy scratch feeding is meant from 12 to 14 pounds of scratch daily per 100 birds, about half in the morning and the other half at night.

"'The following tabulations are the results of lights on 3,940 birds taken in New Jersey. These birds were kept in 14 different flocks and cared for by 14 different poultrymen. These flocks are located in north, central and south Jersey and include flocks from general farms as well as city back-yard flocks and also commercial poultry farm flocks.

## TABLE NO. 1

| | Sept. 1918 | Oct. 1918 | Nov. 1918 | Dec. 1918 | Jan. 1919 | Feb. 1919 | Total |
|---|---|---|---|---|---|---|---|
| No. of flocks | 14 | 14 | 14 | 14 | 14 | 14 | 14 |
| No. of birds | 3940 | 3940 | 3940 | 3371 | 3878 | 3745 | 3802 |
| No. of eggs | 35463 | 45190 | 53188 | 39771 | 52896 | 54003 | 280511 |
| Per cent production | 30 | 37 | 45 | 38.06 | 44 | 51.5 | 41 |
| Average for state where no lights were used | 26 | 13 | 15 | 20.4 | 25 | 33.3 | 22 |
| Increased egg production due to lights | 5051 | 30312 | 35458 | 15686 | 22601 | 18050 | 127158 |

"Note that there is a variation as to the number of birds. This was made necessary as some owners were late in making their returns. In fact in some cases it was necessary in order to get the monthly records to copy them from the poultrymen's daily production. As near as possible, representative flocks were substituted or used.

"Although there may be an error of a few days on some of the individual records, still the average of the aggregate should be quite accurate and at least represents the average results which one may expect by using lights.

"The results (see Table No. 1) show a little bit less than double egg production due to lights and when eggs are figured in dollars and cents, they show four times the net returns over the cost of feed and lights in the lighted pens.

"These flocks showed much better condition of health, etc., as a whole, than did the birds not under lights, and although in most pens the lights were discontinued by April 1st, these hens are laying today (June 1, 1919) about the same number of eggs as the birds which have not been under lights.

"The practice of artificially lighting hen houses has shown beyond a shadow of doubt, that it will materially increase fall and winter egg production which follows during the spring and summer. It has also shown that it is not a forcing or so-called "burning up" of the hens, but is rather giving the hens an opportunity to do what they should do and that which they seem to be anxious to do."

## PRACTICAL DETAILS IN REGARD TO ARTIFICIAL DAYLIGHT FOR LAYERS IN WINTER BY ONE WHO KNOWS

It is our opinion that Mr. and Mrs. George R. Sharp, of the Western Washington Experiment Station, at Puyallup, have had more practical experience in using artificial lights to increase winter egg production than any other poultrymen in this country. From our own experience their recommendations are absolutely sane and safe. Therefore, we quote from their monthly bulletins as follows:

"There has been considerable discussion among poultrymen regarding the possible overproduction of winter eggs if all poultrymen practice the lighting of their flocks. The bogy of overproduction of high-priced eggs has been heard for years, but every year the price has advanced over the preceding one and the ability of the public to continue to consume the increased output has always kept ahead of the supply.

"There is no doubt that, were winter conditions in all parts of the country as favorable for egg production as on the Pacific Coast, the use of artificial daylight would increase the present 10 per cent average winter yield throughout the country to approximately spring production. Fortunately for the Coast poultry business, the severe weather in other localities, the consequent lack of succulent green feed and the extreme difficulty of keeping birds comfortable, will always discourage attempts at high winter production of eggs.

"Another factor is the poultryman who has gone into the business as an easy way to make a living. He is very much opposed to getting up early in the morning and to working with poultry after dark. He always prides himself on the few hours he has to spend with his chickens. "This thing of cleaning the droppings boards every morning and renewing the litter frequently, is all bosh," he says. There are many of this type who will never go to the extra work of using artificial daylight. The egg production from their poultry is probably not much greater than that of the average farm flock.

"The transportation facilities are much improved in recent years. As an instance, during January and February, 1918, many car loads of fresh Washington eggs, mainly produced by plants using artificial light, left Seattle for New York City at the highest net prices to the producer ever experienced up to that time.

"In using artificial light for poultry, the caretaker should clearly understand the function of these extra hours of light. The light is not used as a means of forcing the birds to lay unnaturally. There should be no stimulation such as is derived from condiments or a too liberal supply of green cut bone. Production carried past the bird's ability to renew the wear and tear on her digestive organs, we believe would be rightly termed "forcing."

"An instance brought to our notice recently was an experiment in lighting carried on by a well-known Experiment Station. The endeavor there, as expressed in the report, was to "fool the birds." They were lighted at various hours, starting at 4:00 A. M. and finishing at 1:00 A. M. The report as tabulated showed a very good production for the first few weeks, but later on the birds all went into a molt, and as a consequence the Station officially announced that artificial lighting is a mistake.

"The whole endeavor in campaigning for winter eggs should be based on the attempt to produce, as nearly as possible, springtime conditions. These are:

(1) Succulent, tender green feed; a plentiful supply of worms and bugs; warm, soft earth to dust in.

(2) Mild weather conditions; no severe storms or cold to combat.

(3) At least 14 hours of daylight in which to eat and digest food.

"The first condition is produced by feeding kale, which usually stays green all winter in this climate, for green feed. The equivalent of the worms and bugs is supplied by feeding fish meal, beef scraps, fresh blood and milk. An inside dust bath where the sunshine strikes, supplies the soft earth.

"The second requirement is met by a properly constructed and ventilated laying house with a good muslin curtain in front.

"The third essential, light, can be supplied by several different equipments. Whatever equipment is used it is necessary to use a very small and dull light to put the birds to roost after the brighter lights are turned out.

## ORDINARY KEROSENE LANTERNS

"We have often suggested to the prospective user of artificial lights for poultry if he is at all skeptical as to the benefit to be derived, that he hang up a few kerosene lanterns in some of his smaller coops. The ordinary kerosene lantern will stand only one year of constant service demanded in coop lighting. We do not recommend this plan because of the comparatively small amount of light given, and the large number of lanterns required for a commercial plant. The service is very inefficient, and as the lanterns have to be cleaned and refilled every day, the time required for keeping them in shape is greater than with any other system. The fuel cost is also greater. At one time the writer cleaned the globes, trimmed the wicks and filled the bowls of some thirty-one lanterns every day. The same lighting service was secured the next year with only six gasoline lanterns, and there was a great saving of time and fuel in the operation of the latter.

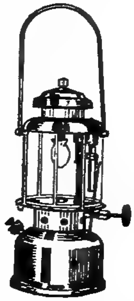
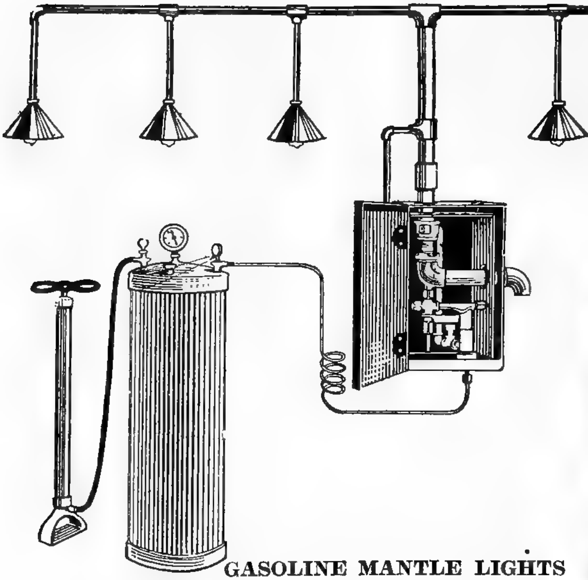


Fig 2 This small gasoline mantle lantern is easier to carry than the large lantern. It has the same lighting power, but requires more time to operate, because of the daily filling and pumping up.

"The writer has had ten years' continuous experience in using artificial light for poultry. Beginning with kerosene lanterns, he changed to gasoline lanterns as soon as he became acquainted with this improved light, later used a hollow wire gasoline system, then a tube gasoline system and finally a home electric plant. He can confidently assure poultry raisers in Western Washington that the judicious use of artificial light, in conjunction with proper housing and feed, will prove profitable through increased production, and will not in any wise injure the birds or reduce their vitality.



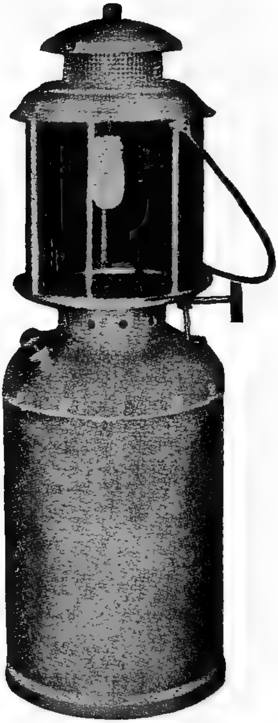


Fig. 3. Large gasoline mantle lantern specially designed for lighting poultry houses. One filling with gasoline lasts about a week, and more air pressure is added each day without losing the pressure already in the tank as in the smaller lantern which has to be filled every day and the air released in the process.

## GASOLINE MANTLE LIGHTS

"The gasoline mantle light is one of enormous candle power and has been used very largely on the Pacific Coast for lighting poultry houses. The cost of lighting is said to compare with a rate of 1½c per kilowatt hour for electricity.

"For a house 30 ft. long or less, the individual lanterns are the best to use. A 50-foot house needs two lanterns, while a house 100 feet long or over had best be lighted with the tube system. In the tube system the gas is all generated at one place and five parts of gas are mixed with 95 parts of air, the air being carried into the generator by a conductor pipe from outdoors. This is the principal advantage this system has over the lanterns or the hollow copper wire system.

"The lanterns and hollow wire systems are fed the 95 parts of air directly from the coop. This air is always full of dust, which eventually will clog the gauze strainers of either of them, and a dull light is the result. One drawback to the tube system is the condensation of the gas back to gasoline in the large conveyor pipe whenever a draft of cold air strikes the pipe. In warm heated buildings, such as stores or churches, there is little difficulty of this kind, but in the poultry house it is advisable to insulate the pipes with a heavy covering, and all plants should be installed with a T-trap to catch the condensed gasoline before it gets back to the generator and spoils the mixture. Too rich a mixture makes the lights burn red and eventually blackens the mantels. There are no small tip-cleaning wires to get out of order in this system, as in the lanterns and hollow-wire systems, and the lights require no mica shades or glass globes around them. The cost of the tube system varies according to the size. A four-light system for lighting a 100-foot house costs about $60.00 at the present time. Systems can be procured handling 20 or more lights, but the hot gas vapor cannot be carried satisfactorily from one building to another through the cold air outside.

## ELECTRIC LIGHTING

"There is no doubt that the electric light is the most convenient and safest method of lighting poultry houses. The cost in some instances is considerably greater than where other systems are used, but in no case is it very great considering the benefit that may be derived. In fact, one extra egg a day will pay for the lighting of 100 birds. This Station has demonstrated in carefully conducted experiments that the use of lights in conjunction with other specified ideal conditions will increase production from 30 eggs per day without lights to 60 with lights, per 100 birds.

"Electric lights should be spaced about 15 feet apart through the entire length of the laying house. They should be placed well towards the front of the house to permit the light to cover all the floor under the droppings boards, otherwise many birds will stay in the shadow there and sleep instead of working while the lights are shining. In a house 20 feet wide we recommend the 50-watt nitrogen lights for best results.

"Many poultrymen who have finally arrived at the stage where their plant brings in a good revenue are now installing home electric light plants. These plants have been developed until they are practically foolproof. They have the advantage over other lights of greater safety and convenience, also ability to light all the bulidings as well as the residence and yard from one plant. The cost of these plants at this time, not including the wiring, is upwards of $500,000.

## FEEDING THE ARTIFICIALLY LIGHTED FLOCK

"Where artificial lighting is regularly practiced, the feeding method recommended by this Station for Leghorn pullets laying heavily, based on units of 100 birds, is as follows:

7:00 A. M.—8 lbs. of dry oats, germinated to very short sprouts.

3:30 P. M.—8 lbs. scratch grain.

5:00 P. M.—4 lbs. of a good dry mash mixture wet with water, towhich fresh blood is added in proportion of 1 pint of blood to 1 gallon of water. In the absence of blood, 4 quarts of sour milk or buttermilk may be used, or blood meal, at the rate of about 10 per cent of the mash fed, mixing this with a suitable quantity of water.

7:30 P. M.—Kale.

"Dry mash is supplied in hoppers, and during the day one hundred birds will average to consume about four pounds of this, also about a gallon of clabbered milk, which is fed about 9:00 A. M. The kale, which is fed at 7:30 is greatly liked by the fowls, and when brought in after supper proves to be a good bait to bring the pullets off the roosts, where many of them go after filling up on the mash. Without a bait of some kind they will turn their backs to the brightest lights and the attempt at lighting will be a failure. After a few weeks of this practicce the pullets refrain from roosting early and most of them are on the floor waiting when the kale comes in. After eating the kale they scratch industriously for grain in the litter, eat more dry mash, water and shell, and by 8:30 or 9:00 P. M. are filled to repletion again.

"Our feeding trials have shown no difference in production if the day starts at 5:00 or at 7:00 A. M., providing a 14-hour feeding period is given. One advantage of the latter start is the shorter period before the sun has warmed the atmosphere in the coop, eliminating the danger of the water freezing in the drinking vessels.

"The pullets must never be allowed to drink water with ice in it, or to eat frozen kale or mangles, as they are certain to get bowel trouble and quit laying. If the kale is frozen when the lights are turned on, it should be hung up in the wire front out of reach of the birds until it is thawed out. Enough kale should be fed each night to last till noon the next day. If any is left at that time it is removed from the coop until 7:30 P. M. Neglect in removing the frozen kale and in thawing out the drinking water is usually occasioned by the caretaker having the electric light button over the head of his bed, and when the birds go into a partial molt it is unjustly blamed to artificial lighting. The cause probably was the method of handling the lights.

"Artificial lighting can be overdone. The benefit derived from the lights is immediately apparent to the caretaker, and as the price of eggs is always highest during the short-day period, the temptation is very great to drive the birds past their limit of laying. The skillful operator keeps careful note of the condition of his birds. If the flesh on the keel bone is gradually receding and the birds losing weight, there is a day of reckoning coming and he will most certainly go through a six-week period of greatly reduced production.

"Experience has shown that with the day regulated by artificial light to 14 hours, and with the right kind of feeding, the pullets can be kept in good condition and will continue laying regularly at the rate of about 60 eggs per 100 birds. It is much better to let them jog along at this rate, keeping them healthy, busy and happy, rather than to try to force them beyond this practical, safe limit.

"If they lag, examine the litter for an ammonia odor, indicating that it should be changed; see that ice is not left in the water bucket, nor frozen feed where the birds can get it. If they run up to 75 eggs a day, increase the green feed and cut down on the morning oats and evening grain until they come back close to 60. That is their best gait at this season under all ordinary conditions.

## ARTIFICIAL LIGHTS FOR EARLY HATCHED PULLETS

"The question of the right time to hatch is a momentuos one. On it may depend the success or failure of next season's egg crop. There is a very general belief that early hatches, especially January and February hatches, are unprofitable because the pullets molt in the fall at the time of highest egg prices. March, April and May are the months when most hatching is done. Eggs are then most plentiful and cheapest, and this time of year when the hens are out on the succulent spring range and the fertility of the eggs is highest.

"Experiments carried on at this Station for the past three seasons go to show that early hatches pay best, and the earlier the better. To illustrate, in 1917 one hundred and sixty pullets hatched from January eggs have shown a very remarkable egg production. They started laying June 10th and by August 1st were in full laying. A few started the pullet molt in August, but there has never been more than 21 per cent of them molting at one time. The average length of time for this pullet molt was 47 days; about half the time required for the old hens. The production has never gone under 45 per cent since August 1st, and they have gone through the entire high-priced egg period since the middle of October with production between 60 and 70 per cent.

"These birds after molting are fully matured and lay a beautiful hatching egg. They have been mated to vigorous cock birds and the hatching results thus far (November 28 and December 3) have been quite satisfactory, averaging 61 per cent of eggs set, with 10 per cent mortality of chicks up to the fourteenth day of brooding. We thus have a certainty of more early hatched chicks for next seasons's flock.

"Thus far these February pullets have been handled solely with a view to market eggs. They have had the artificial light and the blood mash after the evening grain feed, as described. The weather conditions have been exceptionally fine thus far. The birds are still in very good condition and have had almost no ailments. Only two have died, and two have been marketed as culls. Many of these birds have now (December 18) laid over 150 eggs, and the flock will average 50 eggs more than April hatch, which, in spite of a reduction of hours of lighting and a reduced ration to retard production show an average of over 75 per cent for the past 60 days.

"The early-hatched pullets referred to above were from the same pen of breeders as the April birds and were produced with the same equipment of incubators and brooders, which would otherwise have stood idle. They cost about 2c more per day-old chick, because of the higher-priced eggs and the lower fertility, but to date they show $1.00 greater profit per bird than do the later hatches.

"These early hatched pullets also served to equalize the daily egg yield in September and October, when the old birds were quitting. With a January or early February hatch there should never be a period of very slack production, as is to be expected when only March, April and May hatched birds are used. This early hatch should be large enough to pay those October feed bills. Another good reason for these early hatches is the certainty of filling your pullet laying house in the fall. Suppose the April or May hatch goes wrong; it is then too late to run another hatch and too many of the less profitable old birds have to be kept over.

## MAINTENANCE OF EGG PRODUCTION DURING WINTER

"Pride goeth before a fall. Just as soon as you take time to congratulate yourself on the exceptionally fine fall egg production you are having, prepare to have the conceit taken out of you by some unexpected condition causing a slump. Even a false molt may overtake you, and in anticipation of the natural difficulties augmented by special local conditions, we will review the factors which made high egg production possible in October and November and then show what to do to keep it up in December, January and February.

"Breeders. Those birds over a year old, of high vigor and good type, with egg records of 150 or more for their first year's laying, are not considered when we speak of fall and winter production, it being assumed that they are going through the molt, resting prior to producing hatching eggs to produce next season's flock. Do not mix them with your pullet flock of fall and winter cash-income birds.

## REVIEW OF METHOD OF GETTING FALL PRODUCTION

(1) Use matured pullets, preferably March or April hatch, taken off range and kept constantly in the house until spring breaks.

(2) A house flooded with daylight, well ventilated, having a good dust bath, and an unbleached musline curtain for the open front; artificial lights to give spring length of day;;; and ample hard-surfaced floor space covered from four to six inches deep with clean litter.

(3) A laying ration in which hard grains, mill feeds, succulent green feed and animal protein are rightly proportioned.

(4) Maintenance of the health of the flock, by sanitation and judgment in feeding and regularity in caring for the birds.

"Pitfalls. The first and hardest problem to combat is the danger of a too high early production. It is only natural, when eggs are soaring and the poultryman has a clear demonstration of the effect of the artificial daylight and the rich animal protein mash, that he will overdo it and crowd the birds past their powers of assimilation. The first danger signs of this condition are:

1. Birds dying from ovary trouble, usually a broken egg in the oviduct, for which there is no cure.

2. Birds becoming lame to totally paralyzed. This ailment is often falsely called rheumatism. It is easily cured by placing birds in a box by a hot stove and allowing their backs to get thoroughly warmed. A ¼-grain calomel tablet for a physic, is also used in conjunction with this heat treatment. The afflicted birds should be kept out of the lighted laying house and all rich animal feeds restricted for a week or ten days, so that they may recuperate. Kale or mangels and sprouted oats is the best diet during this period. The cause of this ailment is thought to be a gas pressure in the intestinal tract due to indigestion, which produces a condition not unlike cramps in humans. This trouble will be more prevalent in cold weather.

"Both of these troubles can be largely controlled by reducing the hours of lighting, thus reducing the feed consumption and assimilation; by reducing the amount of animal protein feeds and increasing the bulky feeds— short-sprouted oats, and kale or mangles; by the addition of more bran in the mash and a reduction of the corn and wheat proportionately.

"The black-tipped comb is always a sign of indigestion, usually of an unbalanced ration of too much wheat, without enough fibrous feed such as germinated oats to carry it through. Too much starch, as in potatoes, shows the same black flag. Usually a couple of ¼-grain calomel tablets will relieve this condition, but the cure is a change of ration.

"The white or pale comb is harder to combat. It is a sure sign that the bird is working past her power of recuperation. Too much blood and vitality are demanded by the intestinal tract. A good physic and a few days' rest in a quiet place, with non-stimulating feed, is the best treatment.

"The birds must maintain a fair amount of flesh on their breast bones to keep up the pace. If the point of the breast bone registers what Mr. Hogan would call "two out of condition," with perhaps one-half or three-eighths of an inch of the bone and skin protruding past the flesh, this is a sure sign that the bird is drawing on its stored-up energy and will have to stop laying so heavily or die.

"Another sign of an overtaxed digestive system in the false molt. This will occur more often when an unusually cold January in draining the vitality to such an extent that the digestive organs refuse to work for a period, causing a partial starving of the fowl, which in turn causes a molt.

"It is a mistake to try for an abnormal production in very cold weather. It is best at such a time to cut down the animal food and the high vegetable proteins such as soy bean meal and oil meal, and to increase the bulky feeds at the expense of the concentrates.

"Damp litter is perhaps the greatest menace to continued egg production. Damp, moldy and frozen grain always causes acute indigestion, and such a condition predisposes to the deadly roup, canker and chickenpox.

"Roup, canker and chickenpox often start from a cold, and the use of a tablespoonful of the following germicide to each gallon of drinking water is urged for this season:

"Pour ½-ounce of oil of sassafras into ½-gallon of water and shake; add very slowly ½-ounce of sulphuric acid. Make this germicide in a glass or stone vessel and keep on hand, using it to keep the birds from getting the infection in the drinking water. Care should be taken that the solution is not strong enough to make the water distasteful, as a lack of water consumption reduces both the size and number of the eggs.

"Be always on the lookout for colds, which are best detected at night on the roosts. Listen for the sneeze or cough, then identify the bird by the labored and unusual motion of the diaphragm."

## LATE ADVICE FROM CORNELL UNIVERSITY POULTRY DEPARTMENT

The following circular sent out, heading included:

### WHY LIGHTS HELP HENS

### Increased Egg Production by Shortening Period of Inactivity During Long Nights.

How can artificial illumination have any effect on egg production, is the question being asked by some skeptical poultrymen who have never made any tests.

The answer is, according to the workers in poultry husbandry at the New York State College of Agriculture, that the light appears to equalize the time between meals and to shorten the period of inactivity of the fowls during the long nights.

The long nights of the late fall and winter months apparently cause the fowls to use a larger proportion of the night feed for bodily needs than would be the case under normal conditions in the spring time when the days and the nights are of practically equal length.

At the time of the year when fowls lay the most eggs in New York State—the months of April, May and June—the days and the nights are approximately of equal length. Under these conditions, fowls appear to assimilate their feed, secure the proper amount of exercise, and form their eggs to best advantage.

The latter part of December there are about fifteen hours of darkness and nine hours of daylight, whereas in the latter part of June the reverse is true—there are approximately fifteen hours of daylight and nine hours of darkness.

In other words, illumination attempts to imitate spring conditions so far as the hours of activity and the regulation of feed supply are concerned.

The following circular sent out, heading included:

### DOESN'T MAKE HEN LAY TWO EGGS EACH DAY

But Artificial Light Does Enable Her to Begin Spring Work Ahead of the Season

Artificial light in the hen house in winter does not make Faithful Biddy lay two eggs a day as some people seem to think, say poultrymen, but it does make conditions such that she does not have to wait for spring to begin her spring work.

The proper use of artificial illumination on layers not only increases the total number of eggs laid each year by the hen, but it gives increased production during the fall and winter when prices are high.

Using light is not a forcing measure, if rightly used, say the poultry workers at Cornell. It merely makes conditions more natural for the hen by lengthening the day and therefore allowing the hen to eat more feed and secure more exercise.

This keeps her body supplied with feed and gives her the activity which produces health and vigor and which is essential to egg production. It gives the hen about 12 hours of night and the same of day.

The hen naturally is not lazy and she does not like, because of darkness, to have to spend fifteen or sixteen hours on the rooost in the intense cold and with nothing to eat during that time. The remaining eight or nine hours on the floor are not enough. She should not be expected to feed as well nor lay as well under these conditions.

How long would the average human being be able to render a maximum service if he slept or remained in bed that long, ask the Cornell workers? Many folks might like to, and suffer the resulting inefficiency, but the hen has no desire to do so, and will get up and start work at 3 A. M. if light is provided.

### AN EVENING LUNCH

An evening lunch is recommended as one good method for using lights and feeding in that way. Prof. H. R. Lewis, a vice-president of this School, one of our instructors and a contributor to Country Gentleman, recently had this to say in that publication about the use of lights and the "evening lunch" method:

"One of the most successful users of lights is Elmer Wene, of Vineland, New Jersey. He is a young man and is operating three large poultry farms in the Vineland district of sunny Southern Jersey. Nine thousand layers wintered and twelve thousand pullets raised each year make up his present working capacity.

### A DOUBLED EGG PRODUCTION

"Are lights really worth while? Do they really increase production?" I asked, in order to get at the fundamentals of the problem.

"Do they!" was Mr. Wene's reply; "why, last winter they doubled my egg production, giving me an average from November to March inclusive of seventy-nine eggs as against forty-one from unlighted pens. This increased production, further, paid a handsome return above increased cost of lighting and care."

"But," I said, "do you find this increase is in total yearly production per bird, or is it simply due to changing the natural time when the hens normally lay their eggs?"

"Both," he replied; "we find that lights properly operated will materially increase the yearly egg production per hen, though not to such a marked degree as increase in winter production would indicate."

This statement was especially interesting to me since it verified data secured by the poultry department of the New Jersey Experiment Station. This study showed that lights would double egg production during the winter when eggs are high and would increase the yearly production per bird by about twenty per cent.

"Have you noted any other effect of the use of lights upon layers?" I inquired.

"Last winter," he replied, "we ran lights on a considerable number of February hatched Leghorn pullets in an effort to carry them through the fall and winter with no marked or prolonged molt, and to our surprise we were able to accomplish wonderful results, so much so that I feel we are safe in saying that lights make it possible to carry early hatched pullets through the first fall and winter in much better condition and with far less molt than can be done without them."

"How about lights on cull hens to make them lay before marketing time," I asked, knowing that this was a debatable question among many users of lights.

"No;; don't do it," he said, "'for it has been our experience in every case that, while we were able to get a few profitable eggs from the culls, we would have been far better off and would have realized much more on our investment in buildings and equipment if we had sold the culls at culling time and filled their pens with normal, well-grown pullets."

"Just what have lights meant to you in dollars and cents?" I inquired.

"Well," he replied, "I should say that, year in and year out, we realize from each laying pullet carried through the winter under lights one-half as much again or a fifty per cent increase in net profit over the unlighted pullets. That is why we are lighting all of our 7,000 pullets this year."

This result again verifies recent experimental results, for we find that at New Brunswick 600 unlighted pullets last year paid a net profit per bird above feed and labor of $3.30, while 500 pullets given morning lights paid a net profit above feed and labor of $5.07.

Anxious to find out more details regarding Mr. Wene's method of lighting, I inquired as to the kind of lights he used and how he used them. Here is his story:

"We have found electric lights far superior in efficiency, in labor cost and in cost of operation to any other method which we have tried. Careful figures kept at New Brunswick, at the poultry department, show that the fuel and operating cost of providing electric lights for 1,100 layers during the five months of November to March, inclusive, last winter, was $0.44 per bird. This means that an increase of one egg in production pays the cost of lighting.

"It was further found that a flock of 1,000 pullets under lights would pay for the complete cost of a farm lighting unit, through increase in eggs laid over unlighted flocks, by the last of February or after being lighted four months. Certainly no progressive poultryman can afford to be without electric lights on his farm. Barn lanterns do not give sufficient light, and there is such a great burden in caring for them. For the small farm flock they may be all right, but not for the commercial man. When wiring our houses for lights we like to have one light for small flocks of fifty birds or less, and at least two lights for flocks of around 100 birds. Two lights make less shadow and give better feeding conditions."

"'But when do you operate the lights?" I asked;; "this seems to be a much debated question."

"I know it is," he replied, "'but we have very definite ideas upon the time to run lights, and we can see a decided swing to our way of doing it on the part of most users of lights in this section. We run morning lights exclusively. We do not bother with night lights, or a combination of night and morning lights. We turn our lights on a 4 A. M. throughout the winter and turn them off at daylight. This is not pushing the birds to a degree where they are weakened and cannot hold up under the strain, but puts them and holds them in the pink of producing condition throughout the winter, spring and summer.

"As to the time of starting the lights, they should not be started until November first, or later, on pullets, and on hens which are going to be used for breeding we feel that January first is early enough. Starting lights earlier than November first with pullets results in an exceedingly heavy production in the early fall, making it almost impossible to hold the birds to this high-producing condition during the severe winter months to follow. The few eggs gained by starting lights before November first will be more than offset by the loss in production during the cold-weather slumps which are sure to follow.

"The idea in running the lights on hens is to allow them to go through the molt normally, get back their body weight and come into normal producing condition before they are lighted. After this time the use of lights in moderation will not injure their breeding qualities and is, we believe, a safe practice. Great care must be used when the lights are finally turned off in the spring. It is generally unsafe to stop the artificial lights until the normal daylight hour has about caught up with the artificial day. This means that it is unwise to attempt to stop the lights before April first or somewhat later. A very important point is always to turn the lights off gradually in the spring, never shortening the artificial day by more than ten minutes on any one day. Failure to heed this rule is, I firmly believe, the most common and serious cause of unsatisfactory results from lighting."

In its final analysis, the use of lights becomes and is a feeding problem. By lengthening the day, more time is given the birds to consume more food from which they can produce more eggs. Just lights and no more food and water would accomplish nothing; so it was wtih interest that I learned of Mr. Wene's feeding practice. He said:

"Feeding is a very vital problem in handling birds under light. One can overfeed and throw the flock off, or one can underfeed and put them in an emaciated, partly starved condition in a few weeks. We like to feed grain at least three times and sometimes four times daily. One must keep the birds active and exercising. Where we run morning lights, we feed grain at 4 A. M., which is put in the litter the night before; again at 8 A. M., at 1 P. M., and just before dusk. The one-o'clock fedeing may be omitted if time does not permit feeding so often. The heavy feeding is at dusk and at 4 A. M.

"Birds under lights must be fed at least fourteen pounds of grain a day to each 100 head and, in addition to this, all the dry mash they will eat by leaving it before them all the time in self-feeding hoppers. Plenty of fresh water must always be available, especially when the lights are turned on at 4 A. M. This means that some method of keeping the water from freezing in zero weather must be provided, either by the use of nonfreezing water fountains or by electric heaters, or in the absence of these, the poultryman must get up and water his flocks."

## THE EVENING LUNCH

Lighted birds are in a much more artificial condition, an unnatural or at least an unseasonable condition, requiring the best of care and handling through the period of artificial stimulation.

"Do not stop feeding early and late when the lights are finally turned off."

The New Jersey Experiment Station has for three years been experimenting with an evening lunch. The method is showing great promise.

The plan of evening lunch is to let the birds get up in the morning at dawn and go to perch at dusk as they do normally without lights. In order to shorten the long winter night period, thereby getting them to eat more food and maintaining them in better health, the lights are turned on at 8 P. M. and left on for one hour, at which time the birds are given plenty of grain feed and fresh water to drink. Last winter, at New Brunswick,the flocks performed just as well under the evening lunch as they did under morning light. No dinners will be necessary at 9 P. M., for after the first night or two the birds will learn that they have but a certain time on the feeding floor, and a flash or two of the lights at nine o'clock will send the few stragglers on the floor quickly to the roosts.

The following are some of the advantages of the evening lunch:

"Allows the birds to get all the additional feed they require.

"Reduces cost of operating lights by not requiring them so long.

"Eliminates the need of feeding and watering at 4 A . M.

"Gives the birds longer hours on the perches for sleep and rest.

"Does not break into the normal time for getting on and off the perches.

"Gives as good results as any other method of lighting yet tried with fewer drawbacks."

The nonuser of lights is seriously handicapped in competition with his progressive neighbor who has installed a farm lighting unit and is getting more eggs when the price is high.

Lights have a place on the farm, with the suburban flock, and most assuredly they are a part of egg farming.

## QUISENBERRY'S RECOMMENDATION ON LIGHTING

1. Lights give best results and the birds do best if they are used about three hours in the morning.

2. They can be used both morning and night with good results, or at night only if that is more convenient for you.

3. Never compel your hens to work more than fourteen hours.

4. If you find your hens cannot stand the strain and are breaking down, reduce the time lights are used.

5. Any kind of strong light that is economical and safe, is satisfactory.

6. Remember that there is no virtue in the light alone. If you are to get eggs as a result of the light, the hens must be fed the right feed in the right quantity, and properly housed and cared for.

7. This is not an imposition on the hen. During ordinary winter days there is not enough daylight to give the hen any time to consume more food than is required for her own body maintenance. It is not the cold that keeps her from laying in winter, if she is properly bred, but it is the lack of time to consume surplus food out of which to manufacture eggs.

8. Do not use this method on birds which you intend to use as breeders. Better let nature take its course in that case and let your breeding stock rest and exist on a maintenance ration right up to the time you are ready to use the eggs for hatching.

9. This method of artificial lighting can be applied to chicks being grown as broilers, or on immature pullets, which you wish to develop and bring into laying condition.

10. This system is most effective from September 1st to April 1st, and is of little value the remainder of the year.

11. It is best to use a strong candle power light. If your birds cannot see to eat, they get no benefit from this practice.

12. If you use lights, see that the birds are supplied with water and feed during the hours in which lights are used. Dry mash should be available in boxes or hoppers so the hens can get to it readily. Grain should be in the litter early in the morning. During the heavy laying period see that the layers consume a few more pounds of mash than grain. Provide some succulent green feed.

13. Whatever method of lighting is used, it is necessary to use a dull light to put the birds to roost.

14. Lighting can be overdone. If your birds break down, reduce the lights.

15. Be very careful not to make any sudden changes in your feeding methods or in the hours of lighting. If you do, your birds are almost certain to go into a moult and egg production will be checked.

16. The use of lights will not materially increase the year's production of any pullet or hen, but it will cause her to produce the eggs in winter when eggs are high and scarce. This is where you profit most.

## DESCRIPTION BY PROFESSOR RICE OF THE SIX COLORED CHARTS

Plates I and II attempt to illustrate the amount of daylight and darkness each month of the year in New York state and the way the length of the night and the day influences the normal distribution of egg production throughout the year in the case of hens and pullets.

Plates III, IV, V and VI show the various methods of providing artificial illumination influence the distribution of egg production with hens and pullets.

In the first illustrations the same graph is used to display the periods of daylight and darkness, since the flocks under experiment were observed for the same length of time—namely, from November 4th to Ostober 31st, a period of forty-eight weeks.

It will be seen that in representing the periods of night and day on a flat surface it is necessary to divide the periods of darkness at midnight so that reading the hours of the day and night on the left of each graph, from the bottom up, one can determine the changing time of dawn and twilight for each period of the year. If this is done it will be noticed, as shown by the arrows, that on the shortest day, Dec. .21st, the daylight is approximately nine hours and the darkness approximately fifteen hours long and that on the longest day, June 21st, the exact reverse is true, namely, a fifteen-hour day and a nine-hour night, and that on March 21st and September 21st the nights and the days are equal—twelve hours each—which is approximately the condition each day of the year near the equator where the domestic fowl is supposed to have originated.

Assuming that the periods of the year in New York state when the nights and the days are essentially equal are the most favorable for production, it naturally follows that during midsummer the fowls have longer periods of daylight than they normally require and that during the mid-winter they have shorter periods of daylight than they should have for efficient egg production.

The distribution of egg production is shown in Plates I and II, the dotted line giving the per cent production for each four-week period and showing that the expanding period of daylight increases productions and contracting periods of daylight decrease production, with both hens and pullets. In the case of hens the contrast is more pronounced than it is with pullets. This is due to the fact that the hens, at the beginning of the second or later years of laying, will have laid out their production during the preceding year and generally are not fully recuperated and ready to start a new cycle of laying when the adverse conditions of cold weather and shorter days of the fall arrive, whereas the pullets, if they were hatched so as to begin laying normally in September or October (in New York state) have by that time stored up enough nourishment to produce a considerable number of eggs even under the adverse fall conditions, as shown in the case of pullets, Plate I, and hens, Plate II.

## RESULTS OF THREE DIFFERENT METHODS

How three different methods of supplying light influence egg production on hens and pullets is shown in Plates III, I, V and VI. Both the hens and the pullets used in these tests were under the average in quality, having been left over after the other college teaching and experiment project needs had been provided. However the birds in all of the pullet pens were essentially similar, as were the birds in the hen pens. The birds in all of the eight flocks were fed the regular Cornell rations, and the other conditions, such as the kind of houses, the kind of pens, light wattage, etc., were as near similar as it was possible to make them.

In Plates V and VI will be seen the distribution of production where the light was given from twilight until 9 P. M. during the entire time of the experiment. Thus there was no sudden break or gradual decline in the amount of artificial light given, as is usually the case in actual practice during the late fall and early spring months when artificial lighting normally is started and stopped. Undoubtedly the light was not required during the summer season.

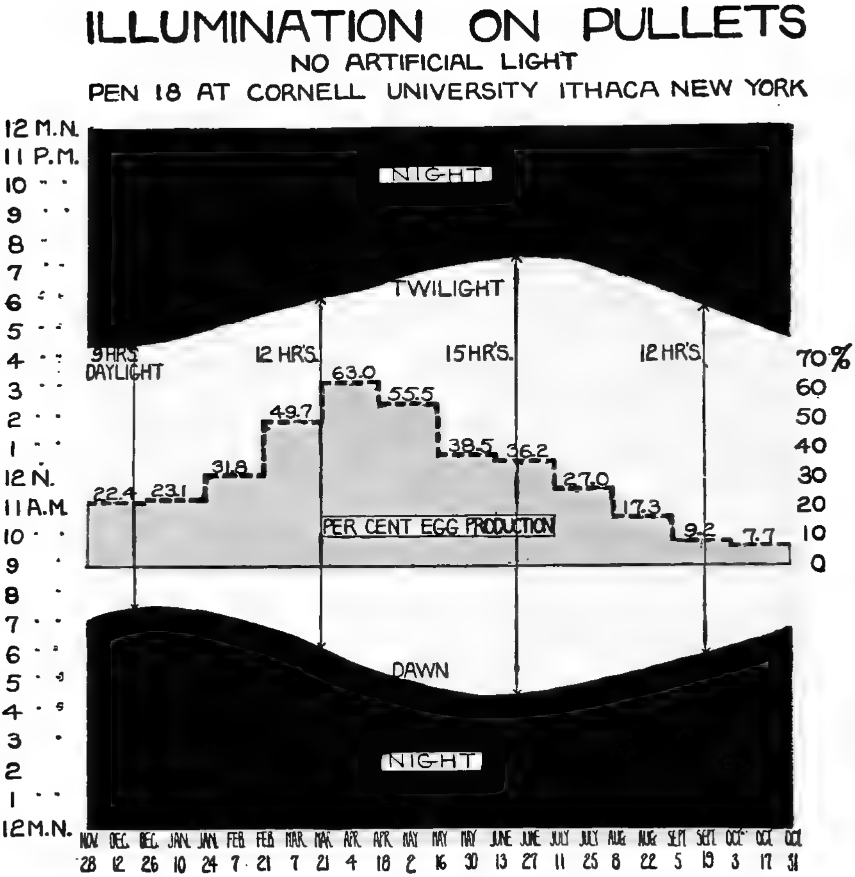


PLATE No. I

Plate I. Effect of Illumination on Pullets. This is a check pen showing production of pullets under normal conditions without lights. The breeding, age, feeding, and general care of these pullets were similar to that of the illuminated pens, except for such changes in feeding as are regularly involved in the use of artificial lights.

The increase in egg production with the hens under illumination was quite marked during the first four months and the last two months, as was also the decline in production from the normal check-pen flock not artificially lighted, as indicated by the open space between the dotted line and the green-colored portion of the chart in the sixth, seventh and eighth periods, which was from about the middle of April to the middle of July. The gains in production, therefore, were during periods of high egg prices and the losses in production on the part of the pens having illumination occurred during the periods of lowest prices. Essentially similar shifts in production from the low to the high priced areas, though less in degree, resulted with the pullets.

The most marked increase in egg production, due to artificial light, of any of the methods tried in this series of experiments was where illumination was given from 6 A. M. to daylight and again twilight to 9 P. M. to a pen of pullets, thus giving at least a fifteen-hour day during the entire test. Under the same method of illumination the pen of hens produced about the same as in pen 25 (Plate VI), where illumination

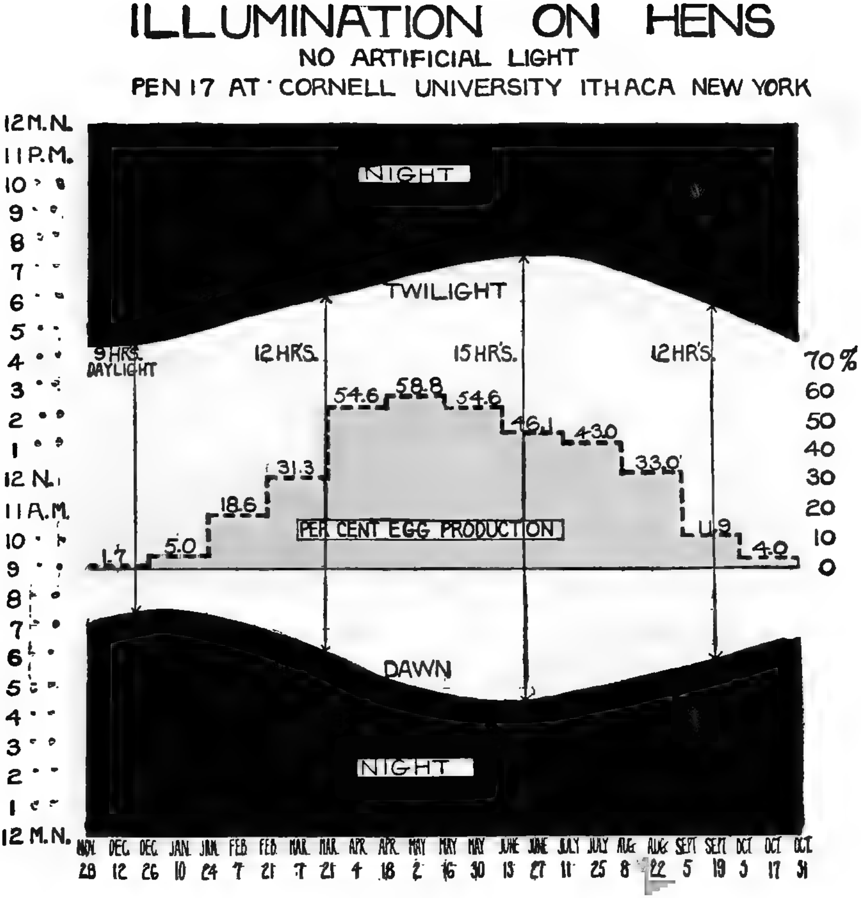


PLATE No. II

Plate 2. Effect of Illumination on Hens: This is a check pen showing production of hens under normal conditions, that is, without artificial light. These hens received good average care, the same rations as the illuminated hens, and probably had somewhat better conditions on the whole than the average laying flock.

was given only until 9 P. M., except that there was practically no decline in production during the summer. The consistently high egg yield during the entire experiment, except a slight drop during the 5th or 6th period, April and May, was striking, indicating that the hens were laying efficiently, which also means happily, throughout the year.

## RULE THAT "WORKS BOTH WAYS"

The real test of any theory or conclusion is whether or not the rule will work both ways which, being applied to illumination, means whether egg production can be increased or decreased AT WILL by the use of artificial light, all other conditions being essentially similar. Two brief tests were made in the "dead of winter" to find out to what extent alternately giving and withholding light would influence production.

Light was given to a flock of hens until Dec. 16th, at which time the lights were discontinued until Jan. 19th, a period of four weeks. The production had been 36, 32 and 26 per cent respectively during the three preceding weeks and during the next three weeks it declined until

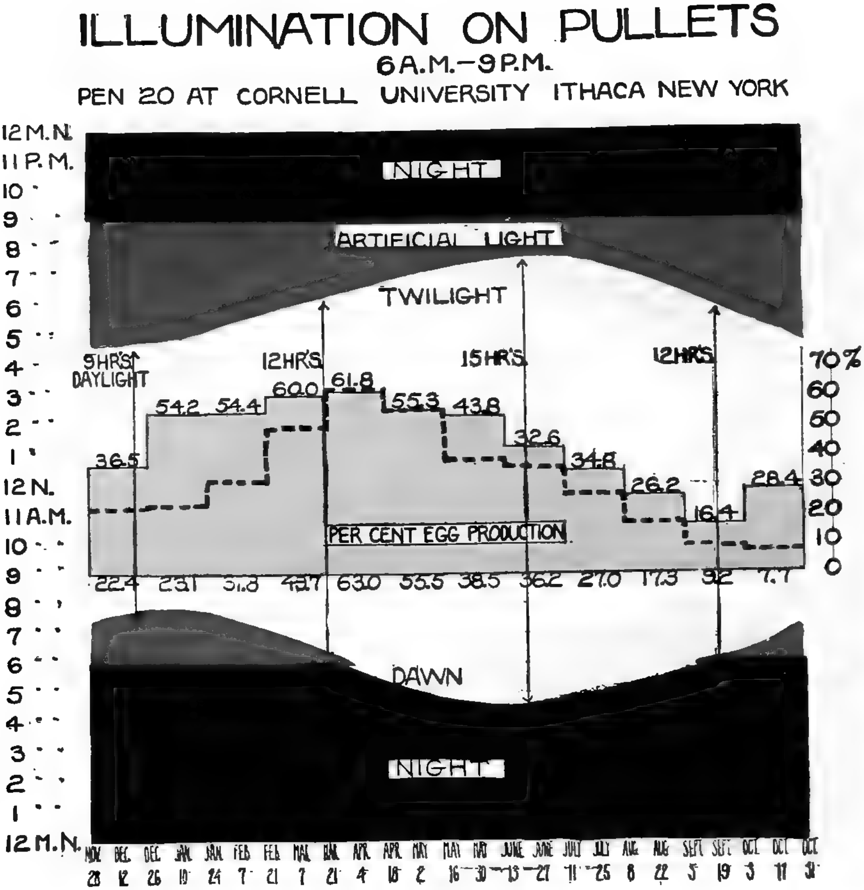


PLATE No. III.

Plate 3. This pen corresponds to the one whose record is represented in Pate 4, pullets being substituted for hens. Similar increase in production with no important difference between this pen and the one that had light only in the evening.

the fowls ceased laying. During the second week following the turning on of the lights again, the production raised to 25 per cent, but notwithstanding the lengthening of the natural daylight period at this time, the hens did not reach even a normal production up to the date when the test was discontinued, the latter part of March.

The production of a flock of hens of similar quality under similar feeding and care was not given artificial light. The production of a similar flock of hens which at the same time was receiving illumination until 9 P. M. continuously, declined somewhat during the very severe weather, which prevailed at the time the test was made, they, nevertheless, maintained a yield of 33, 22, 20, 15 and 24 per cent production, while the flock whose light supply had been turned off, steadily declined and finally ceased to lay.

In order to observe the comparative effects between abruptly withholding the lights and abruptly turning them on again, as compared to diminishing and increasing them gradually, the test was made with a flock of hens similar in quality to determine the influence of restricting

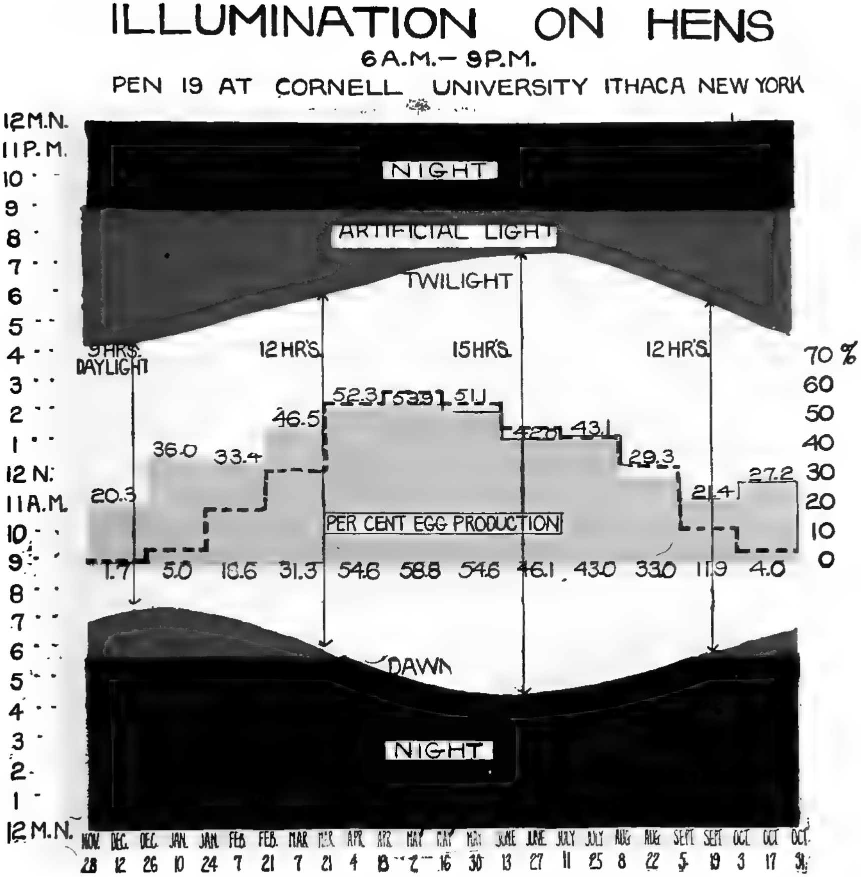


PLATE No. IV.

Plate 4. Effect of Illumination on Hens: Lights from 6 A. M. to 8 P. M. The purpose of this test was to learn, first, the effect of artificial light on egg production and, second, to compare the effect of lights both morning and evening with lights only at night, as in Plate 5. The same improved production is shown as in Plate 6, and this experiment indicates that it is not a matter of any practical importance whether the light is given all in the evening, or both morning and evening.

the amount of light fifteen minutes each night until no lights were given and then continuing without lights for one week, then resuming the illumination gradually by increasing the amount of light fifteen minutes each day until the regular amount was given, namely—from twilight until 9 P. M.

The same flocks used for comparison show that the production declined more gradually, but did not cease entirely, though it reached an average of 3.4 per cent production for one week while no illumination was given and then gradually rose to 5, 13, 18, 26, 28 and 29 per cent respectively in direct conformity to the increase in the amount of illumination, fifteen minutes each day until the normal amount of artificial light 9 o'clock was reached.

From the preliminary tests here reported one would not be justified in drawing final conclusions as to the most efficient methods of illumination. The breed of fowls, the laying quality of the stock, the condition of the birds, the climatic conditions and methods of feeding—ALL these

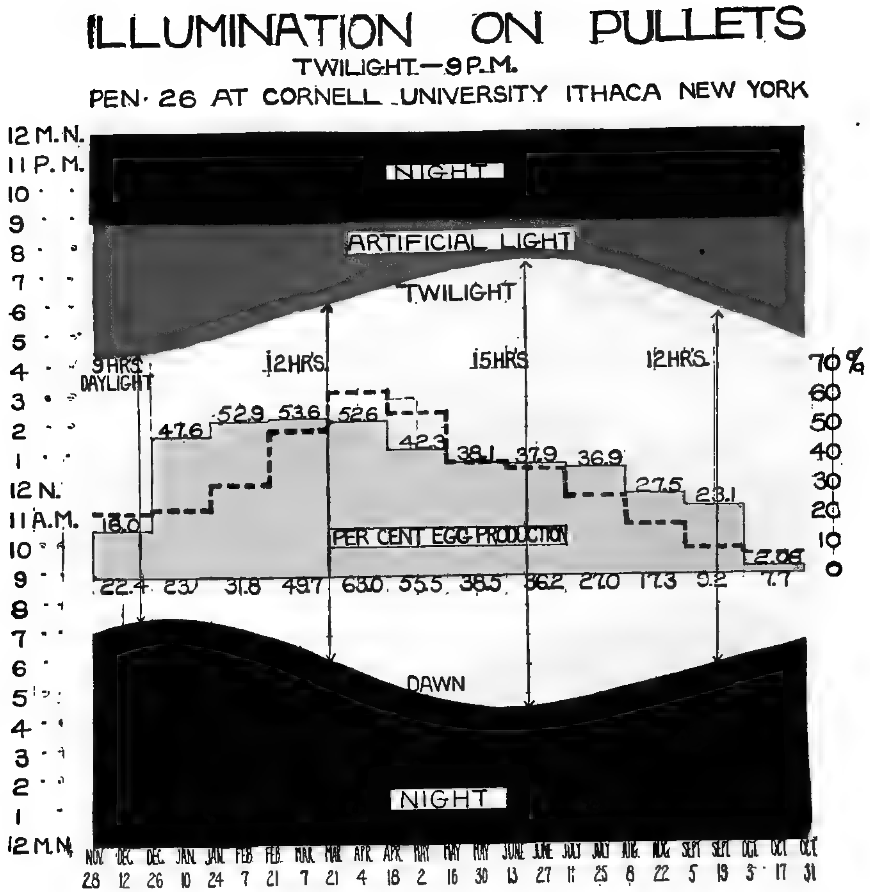


PLATE No. V.

Plate 5. Effect of Illumination on Pullets: Twilight to 9 A. M. This pen corresponds with the one represented by Plate 6, pullets being substituted for hens. All the artificial light was given in the evening, starting at 4:30, the last of November, and at twilight throughout the year. Artificial illumination produced the same good effect on the pullets as on the hens, though, as usual, the unlighted pen exceeded the illuminated ones during the low-price months.

are important factors which, in other years, under similar conditions even in the same location, or in the same year in different locations, might produce different results. These tests, however, JUSTIFY THE CONVICTION that artificial light was the factor CHIEFLY RESPONSIBLE for the increase or the decrease in production at various periods. This should lead us to the belief that the proper application of artificial light when it is correctly understood, IS LIKELY TO BE OUR MOST POSITIVE METHOD OF CONTROL OF EGG PRODUCTION.

## QUESTIONS, LESSON NO. 23

1.—What is the object in using artificial lights in poultry houses?

2.—When they first came into use were artificial lights generally accepted as practical?

3.—What has been one of the greatest weaknesses of the poultry business in the past?

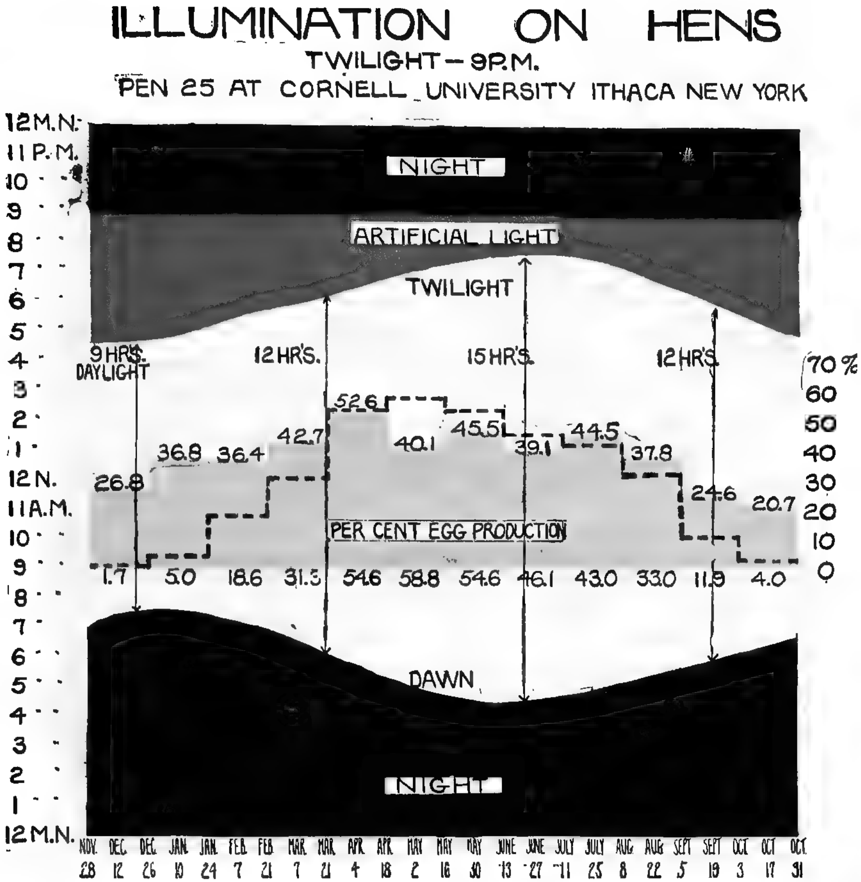


PLATE No. VI.

Plate 6. Effect of Illumination on Hens: Lights from twilight to 9 P. M. throughout the year. The period of artificial illumination daily varied from 4½ hours in November and December to only 1½ hours in June, and gave a day about 14-15 hours long. The production of this pen as compared with that of the check pen (shown in the dotted black line) was much greater from November to March. During April, May, and June—the low-price months—the production of the unlighted pens exceeded that of the lighted, but the latter again came to the front in August, September and October.

## QUESTIONS, LESSON NO. 23—Continued

4.—How or why does artificial lights increase egg production?

5.—Is it best to use the lights morning, night or both?

6.—In what way does the hen respond to climatic conditions in different parts of the world?

7.—Is it the cold of winter or the lack of daylight that has the greatest tendency to reduce winter egg yields?

8.—Is it the light or the feed which really increases egg production?

9.—What kinds of lights are most practical?

10.—Can artificial lighting be overdone? In what way? What is the remedy?

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# How to Build a Trade in Standard Bred Poultry and Commercial Eggs

By T. E. QUISENBERRY

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## INTRODUCTION

The business methods revealed in this lesson are of equal importance to the commercial egg farmer and the Standard-bred poultry breeder. The breeding and selling of Standard-bred poultry and eggs for hatching is by no means an old business in America. Men are still alive who virtually witnessed its beginning. To these same men is due much of the credit for its wonderful growth up to this time. Hundreds of thousands of our best citizens are now engaged, in either a large or small way, in this business. In fact, it is the inter-buying and selling among this vast army of breeders of Standard-bred poultry that has placed the business on a firm, solid foundation.

Today, as never before in the world's history, the importance of a better quality of Standard-bred poultry for meat and egg production is realized and admitted by even our highest Government officials and leaders in the business world. The last Congress appropriated $250,000 to speed up the production of live stock. Out of this amount $148,000 was given to stimulate a greater production of poultry and eggs. This work of the Government in urging every farmer and every citizen with a vacant back yard to take up the breeding of poultry is a great aid to the demand for hatching eggs, baby chicks and breeding stock from good Standard-bred poultry.

The future of the Standard-bred poultry business depends absolutely upon the ability of the breeder to dispose of his exhibition and breeding stock at a profit. The day was when the majority of breeders of Standard-bred poultry were "fanciers" in the strict sense of the word. They strove to produce excellence in fowls for the mere fancy of the thing and the sport they derived from defeating their fellow breeder in the poultry show room.

Times have changed. Today few fanciers of the old sort remain. Instead, we find the majority of breeders of Standard-bred poultry are striving for a better fowl, not strictly because of the fancy for the thing, but for the good business reason that the fancier of today, making his poultry work a sole or side **business** and **not a hobby,** fully realizes that the nearer to Standard requirements he can breed his fowls the greater will be the demand for his produce. Again, it is easily apparent that the larger the per cent of choice fowls the breeder can rear each season, the fewer he finds necessary to market and the greater the number he can dispose of for exhibition and breeding purposes, thus greatly bringing up the average price received for the season's crop of youngsters.

We feel safe in saying there are more breeders **able** to raise a very good quality of poultry than there are breeders able to sell their produce at a profit. Why? First, let us analyze the business. Take, as a parallel example, the business of manufacturing incubators and **selling them** by mail direct from the factory to the purchaser Such **a business needs,** first of all, a man or men who can plan the building of a successful hatching machine. Second, the business must have a factory and skilled workmen in order to manufacture the finished machine ready for market. Third, it must have an office and a force of office workers, some of whom, at least, are skilled in the art of advertising and selling by mail. These same men, experts at "selling by mail," may not be able to hit a "nail with a hammer and miss a thumb," and, vice versa, the machinist in the factory probably never wrote an advertisement in his life. With poultry, the breeder must be the inventor, the carpenter, the machinist, the advertiser, and the salesman.

The Standard-bred poultry business is essentially a mail order business. To succeed—to sell at a profit—the breeder must first have well bred standard stock worth the price asked for it. The breeder must breed his stock so carefully and so vigorously that it will reproduce its like in the hands of customers. The better quality stock one breeds, the more money it is worth, and with proper methods of advertising and selling employed, sooner or later a class of customers will be secured who will pay the worth of the produce, thus creating a wider margin between the cost of production and gross selling price. Next, the breeder must know, or must learn, **how, when** and **where** to **advertise,** and must learn the simple, straightforward and fundamental principles of writing "letters that sell," as well as the other important methods of handling prospective customers by mail. We say customers for the very good reason that no two are alike, and the more adept one becomes at reading between the lines of a letter received from a prospective customer and deciding his needs and wishes accordingly, the more successful the breeder becomes as a salesman.

Again, the breeder must make progress in manufacturing material to be used in his advertising. By that we mean he must demonstrate in his own hands, in the hands of customers, or in some form or manner, that his fowls have a certain degree of merit. If breeding to perfect a strain of high egg producers from a variety of standard fowls, his ammunition for advertising would be some honest trap-nest records at home or in an official laying contest, the latter being stronger and unquestionable evidence. If the variety is being bred mainly to approach as closely as possible the Standard requirements, then prizes should be won at poultry exhibitions. The greater the reputation of a show, the more effective in advertising will be the winning made. The most effective material for good advertising is a combination of an official laying record and a prize record in poultry exhibitions.

It is not our purpose in this lesson to tell how to produce more and better Standard-bred poultry. It is to help solve the seeming difficult and complex problems incident to building up a profitable and dependable trade that this lesson is written. We consider it covers an indispensable cog in the wheel of making a success in the poultry business. The problems considered are of distribution rather than of production—problems of business management rather than of housing. hatching, feeding and caring for poultry.

## EGG FARMING AND STANDARD BREEDING COMBINED

It does not matter if you get the major portion of your income from the commercial egg business, it will pay every egg farm to keep Standard-bred poultry and sell stock for breeding purposes, eggs for hatching, and baby chicks, to those who desire them. The best and most successful egg farms in this country are doing that very thing and profiting by it. It is as necessary for the commercial egg farmer to have some instruction along the lines of this lesson as it is for the men who depend entirely upon the selling of exhibition and breeding stock, eggs and chicks.

These facts make this a very valuable lesson. No matter whether you expect to secure a position on someone else's farm or whether you expect to build up a profitable business for yourself, you ought to master the facts contained herein. Study that you may master the secrets of good salesmanship, and familiarize yourself with the right and wrong things to do in building up a trade in Standard-bred poultry.

Whatever you do, even on a commercial egg farm, keep Standard-bred poultry of one variety, and push your sales of stock, chicks, and hatching eggs for breeding purposes. This will help materially to increase your income, and help swell your net profit at the close of the season.

## THE NATURE OF THE STANDARD-BRED POULTRY BUSINESS

The Standard-bred poultry business, as a business, is unique in several ways. It is largely a mail-order business. Buyer and seller perhaps never see each other, though dealing with each other for several years. The birds, or baby chicks, or eggs for hatching, are bought and paid for before they are seen. Whether they give satisfaction, or not, depends upon a number of contingencies, chief among them being the care with which the buyer described what he wanted, and the care and honesty with which the seller described what he had for sale, and the ability of the buyer to recognize qualities and defects and to determine the true worth of a fowl.

Values in the Standard-bred poultry business are not intrinsic; they are relative. That is, the value of a Standard-bred cockerel is not based upon his weight, nor the price of a pure-bred egg, or upon its food value. This being a peculiarity of the Standard-bred poultry business in addition to the fact that it is a mail-order business, makes it readily apparent that he who would succeed in it must be a good "salesman-on-paper." He must learn the knack of developing the interest and confidence of other breeders through carefully planned advertising. The idea being to induce other breeders to write him, describing their wants. Such letters are termed inquiries. He must develop the faculty of being able, when answering inquiries, to so describe that which he has for sale as to create a sufficiently strong desire in the mind of the prospective customer, that he will part gladly with his hard-earned cash. This is an art which can be acquired, and which should be studiously cultivated by every beginner in the Standard-bred poultry business.

He must learn to study the "inquiries." If the prospective purchaser desires a fowl to exhibit and later to breed from, it will require a "finished show bird" at the time shipment is made. Such a fowl must be priced higher, in show season, than a fowl of the same quality, but hardly so well matured in growth of plumage; besides, sad to relate, the average purchaser will gladly part with more money in order to obtain a bird to win with at some poultry exhibit than he would even consider thinking of paying later in the season for a fowl to use strictly for breeding use. Then again note that a purchaser desiring a show bird to exhibit at a leading state show, or at Chicago, or Kansas City, would want only the very best of finished quality and would expect to pay more than if he were purchasing a fowl for use at some minor exhibit.

## THE BASIS OF VALUE IN STANDARD-BRED POULTRY

The person who is about to embark in the Standard-bred poultry business should, both for his own sake, and for the sake of his customers, form a clear idea of the basis of value in Standard-bred poultry. As has already been suggested, the basis of value is not the flavor of the meat, nor the freshness of the eggs; it may be based upon one, or a combination of several factors.

The main reason why a Standard-bred cockerel is of greater value than a scrub cockerel is because he is Standard-bred, and, being Standard-bred, is more able to transmit his superior qualities to his offspring. The Standard-bred cockerel depends, first, upon his individual excellence; second, upon his breeding, the strain or family to which he belongs and its reputation for Standard qualities and egg production; third, the prizes, if any, which he has won; and fourth, the reputation and integrity of the breeder who produced him.

By "individual excellence," we mean, commonly speaking, how much the bird scores—the degree to which he approaches perfection in body, shape, and color markings. The extent to which individual excellence should govern the price, varies. A solid colored bird which scores ninety points is not worth as much as a parti-colored bird with the same score. Again, a cockerel scoring ninety points, that is the result of an indiscriminate mating, is not worth as much as a cockerel scoring the same amount, that is the result of years of careful selection, scientific mating and line breeding. The real value of any bird depends upon its ability to transmit its good qualities to the offspring. The winning of a prize, in competition, adds to the selling value of a bird, on account of its advertising value. The more prominent the show and the stronger the competition, the greater will be the advertising value of the prize won, and the more it will add to the selling price of the bird that won it.

The **reputation** and **integrity** of the breeder are extremely important factors in fixing the price of Standard-bred poultry and eggs. Right here is where a great many young breeders make a serious mistake. They seem to think that just because they paid a hundred dollars for a pen of fine birds, they should be able to sell the progeny of that pen for prices equally high. They cannot do it, simply because they are not well enough known. The customers who are willing to pay the highest prices go to the breeders with well known reputations. To attempt to secure prices the equal of those obtained by breeders with a reputation of several years' standing is to invite disaster. Reach out for a safe and dependable margin of profit. Sell quality for less than it is worth. Build up a volume of business. In time old customers and their acquaintances will come back and pay you higher prices.

It requires years of work, of showing and advertising to reach a position where people will be willing to pay you fancy prices on account of your reputation as a breeder of quality stock. During the first few years you will find this to be true—that it will be far better for you to sell ten cockerels at a net profit of a dollar each, than to sell one cockerel at a net profit of $10.00. Just what prices you should charge depend largely on local circumstances and conditions, as well as upon the quality of your stock. It certainly should never be less than $3.00 to $3.50 for a cockerel, $2.00 for a setting of eggs, or $6.00 for one hundred eggs from a range flock. Remember, you must sell at a profit or quit, and when you go into the business of selling Standard-bred poultry by mail you must add to the cost of producing your fowls your cost of exhibiting, advertising, printed matter, postage and shipping. Quite a large overhead expense is soon built up. To lessen your "cost per bird" you must strive to produce a larger per cent of high quality exhibition and breeding birds, and you must develop a greater volume of business. Both will follow naturally, if care, brains and records are used in mating, breeding and growing, and an increased volume of business will come as "old customers coming back" are added to the new customers secured from year to year.

## PERSONALITY ESSENTIAL TO SUCCESS

Every successful business is builded around a personality. It is "the man behind the gun," not the gun, that counts for the most. If a blind gunner hits the target, it is an accident. He hits it in spite of the fact that he is blind, not on account of his blindness. There are too many "blind gunners" in the Standard-bred poultry business. They "don't know where they're going, but they're on their way," and most of them are headed straight towards failure. If there is any business in the world that one needs to go into with both eyes wide open and in good working order, it is the Standard-bred poultry business.

The same sterling qualities and characteristics which are required in order to achieve success in the modern business world, are demanded of the man or woman who would be successful in building up a trade in the Standard-bred poultry business. In other words, the Standard-bred poultry business is a "man's' size" business in which honor, brains, and education count for just as much as they do in any other line of human endeavor. It is a business in which Personality plays the leading role in making or breaking the aspirant. Let us, then, consider some of the personal characteristics which make for success in this fascinating and profitable business.

First and foremost among them is HONESTY. "Honesty is the best policy" even in the Standard-bred poultry business, where there is commonly supposed to be a scarcity of it. A good many years of experience and observation have convinced the writer that there is not nearly as much **intentional** dishonesty on the part of the breeders of Standard-bred poultry as many would have us believe. There are frequent differences of opinion as to the value of birds, and these, all too often, result in the breeder being accused of dishonesty, whereas, the real trouble lies in ignorance, and, sometimes, dishonesty on the part of the purchaser, or in the ignorance of the seller and not an intention to deceive. Be that as it may, there is no doubt but that there are some scalawags in the poultry business. But it does not pay, in the long run. In the end, "the chickens come home to roost," and Mr. Scalawag finds himself, his friends, business and reputation gone, facing a term in the federal prison for misuse of the United States mails. Looking at it solely from the standpoint of dollars and cents, aside from the moral obligation involved, the person who aspires to build up a successful and permanent trade in Standard-bred poultry will find it greatly to his advantage to be governed by the Golden Rule at all times. The going may seem slow, sometimes, but it is a whole lot more certain! Do not forget that "a satisfied customer is the best advertisement," as well as the cheapest.

If you pass the honesty test, perhaps the next most important requirement is that you shall be **in love with the business.** It must possess a charm and fascination for you which no other business has, else the odds are heavily against you in the battle for supremacy. Now and then someone is found who has made a financial success of a business that was "wished on him," and for which he had no special fondness. Such a person is the rare exception, not the rule. I doubt whether such a person has ever made a success of the Standard-bred poultry business. If one is in love with his business he will think about it in the day time and dream about it at night. He will make its every feature a constant study, and will always be on the look-out for "new wrinkles," methods and practices which have made good. The odds are strongly in such a person's favor.

PERSEVERANCE, sometimes called "stick-to-it-iveness," is another admirable quality greatly needed by the person who is to achieve success in the Standard-bred poultry business. Discouragements are bound to come. Birds will fail to win. Advertisements will fail to "pull." Letters will fail to "bring home the bacon." It is at such times, when the temptation is strong to "throw up the sponge" that the quality of perserverance comes to the rescue, and helps one to weather the storm.

The most successful poultrymen in the world today, considered from a standpoint of net profits, are **those who have played square and stayed.** Josh Billings once said: "Young man, consider the postage stamp. It sticks until it gets somewhere." Select some one practical and popular variety of poultry—then improve it, advertise it and stick. That is the only way to succeed. It is oftentimes "darkest just before dawn," and it is the person who sticks when others quit, whose reputation will continue to grow, and whose trade will steadily and surely increase as the years go by.

A **good education** is a great asset in building up a trade in pure-bred poultry, and the lack of it a serious handicap. The ability to express one's thoughts in clear, concise, "King's English," to draw a word picture of a bird that will make it fairly stand out on the written or printed page, is a faculty to be desired. Poor grammar, poor spelling, and worse writing, do not make a winning combination. These are days of keen competition. The breeder who writes the best letter and puts up the most convincing arguments in a plain, straightforward matter of fact way usually gets the order.

Last, but by no means least, comes **business sagacity,** good judgment, and shrewdness, all of which means practically the same thing. A man can be shrewd without overstepping the bounds of honor and integrity, and he must be, if he is to make a marked success of any business. An educated fool is still a fool. Some men, with a splendid college education, fail in business because they lack that peculiar quality known as business sagacity. It is so in the poultry business. Keep your eyes open. Don't take "snap judgment" on anything. Reason it out. **"Be sure you're right, then go ahead."** It is much better to be possessed with a reasonable amount of common sense and lacking in education, than it is to have an over-supply of book knowledge and be lacking in common horse sense.

## LOCATION IMPORTANT

Someone has said something to the general effect that "if a man makes a better mouse-trap than anybody else, the world will beat a pathway to his door, even though he live in the midst of a forest." The general idea which the philosopher had in mind was that the world is on the look-out for the man who excels, even though it be in as humble a thing as making mouse-traps. He uttered a great truth. Yet, looking at it from a cold-blooded business standpoint, our "Excellent mouse-trap" manufacturer would greatly increase his chances for financial success by moving from the midst of the forest to some more accessible place.

If you raise the best Barred Rocks in the country, you can build up a profitable trade, even though you live in the midst of the Great American Desert, fifty miles from the nearest railroad. Yet it would hardly be fair to suggest that you seek a secluded spot in the heart of the Great American Desert, fifty miles from the nearest railroad, in which to commence your poultry breeding operations. In the first place, you will probably not raise the **best Barred Rocks,** or any other variety, in the country. You will have hot competition, and lots of it. Therefore, since the average man moves in the "line of least resistance," and since in buying poultry he keeps a watchful eye on transportation charges, the more accessable you are to the largest possible number of possible customers, the brighter will be your chances for securing their trade.

The matter of climate, especially as it relates to heat and cold, is not as important as some would have us believe. While it is sometimes argued that the milder sections of the country are best adapted for poultry, yet it is a well known fact that some of our very best specimens of the various varieties are produced every year in the Northern part of the United States, and in Canada. A damp climate is not favorable to poultry raising, yet it can be done. Peculiar problems will be found wherever you are located, and these must be carefully studied and solved.

A location where there are good railroads, express and mail facilities is very desirable. After you have been in business a few years the bulk of your trade will be from a distance. The more direct the route, and the shorter the time in transit, the better general satisfaction you can give.

These are days of much traveling on the part of the public, both by steam, electric trains, and automobiles. If ones poultry and poultry buildings can be so located as to make a "close up" view of them possible by many travelers it oftentimes proves the source of many sales. In case such a location is possible, a fairly large sign setting forth in plain letters, as large as possible, the name and address of the poultryman and the variety bred by him should be so placed as to make it easily read by as many passersby as possible.

## APPEARANCE OF FARM

In the case of "poultry-interested" visitors, nothing, next to high quality in your stock, will so imbue them with confidence in you, with enthusiasm for poultry, or with the inclination or desire to part with good money in exchange for some of your stock or hatching eggs as a neat, clean and thrifty appearance about your entire place. It is especially important that your poultry houses, yards, gates, windows, etc., are in good repair. Equipment not in use should be clean and carefully set aside or stored away. Houses and yards should appear fresh and clean as possible. Broken window panes or missing hinges should not exist. Filth should not be in appearance anywhere. All buildings, brood coops, gates, fence posts, etc., should be kept in a well painted condition. This is true both from a standpoint of appearance and economy. Have the most practical and best vermin free houses and yards you can afford. Have clean, sanitary grounds. Tolerate nothing but healthy, vigorous fowls on the place. Have a place for everything and have everything in its place. Follow these rules and you will feel proud while showing the most particular of visitors about. It is such visitors that it is important to favorably impress. They are the ones most likely to desire some of your best stock, and those who will gladly pay the highest prices. Neatness and cleanliness go hand in hand with selling poultry and eggs for highest prices.

## BUSINESS POLICY

The best advertisement for any business is a satisfied customer. A word said against you by a customer to a friend will do more harm than a great many dollars spent in advertising will do good. Again, a satisfied customer will "come back" should he at some future time be in need of your goods. Never, under any circumstances, let a customer get away feeling that you have cheated, or failed to deliver exactly what you sold.

You will receive complaints from customers no matter how careful you may be to fill orders promptly and exactly as you represented. Many things will cause this. In the case of stock, differences of opinion regarding qualities will arise. The purchaser may feel the bird is worth the money paid and still some certain defect is apparent which the purchaser knows he dare not inter-breed into his strain, and, naturally, he cannot use the bird and desires to either exchange it or return it and receive his money back. In the case of eggs, many times good, fresh, fertile eggs will hatch poorly or the germs fail to develop, due to rough handling in transit or some other unknown cause, in which event the customer complains. You know the same eggs are hatching well at home and in the hands of other customers. You feel like doubting the customer's word, but, remember this: "re**gardless of circumstances the customer is always right.**" Let that be your policy. Even if you honestly feel he is wrong, in each and every case where a customer complains, **his viewpoint is right** and it is up to you to **at once** adjust his complaints from his viewpoint, not from yours. Such a policy will cause you extra work and the temporary loss of a few dollars now and then. Just charge your loss to advertising, and, in so doing, have the satisfaction of knowing it is the cheapest advertising you ever bought.

## WHICH IS THE BEST VARIETY?

We are often asked the question, "Which is the best breed or variety?" To this question we reply, "Any one of the popular practical varieties." This depends somewhat upon what branch of the poultry business you are to embark. If you are going into the business to produce only market or commercial eggs and have determined not to sell eggs for hatching, baby chicks, or surplus males for breeding then most any variety of Leghorns, Anconas, Wyandottes, Reds, Plymouth Rocks, etc., will well serve your wants, providing you stock your farm from a strain or family that for several generations have been selected and bred according to the best known methods of selecting, trap-nesting and pedigreeing, primarily for egg production and health. Some varieties are better adapted for certain purposes than others. The chief characteristics of each breed must be studied and considered for the purposes they best fill. For instance, money would be lost if Cochins were bred on a commercial egg farm or Hamburgs for the Capon business.

If you elect to market eggs commercially as well as for hatching and to sell surplus fowls both for meat, breeding and exhibition, then, to succeed, a choice must be made of some variety that is a practical commercial meat and egg fowl and, especially, one that is popular. By "popular" we mean a variety that is nearly always represented by large classes in poultry shows, and has a large number of advertisers in poultry and farm journals. A live merchant handles the brand of goods that sells. With Standard-bred poultry, if you expect to build a profitable business, you must breed good quality stock of one of the varieties most in demand. Care not for competition. Breeders buy from one another. That is the foundation of the business. Where there are a large number of breeders there will be a large amount of business. You can get your portion of business by staying with it, by improving the qualities of your fowls as egg producers, by conforming more closely to Standard requirements, and by proper exhibiting and the many other important steps pointed to in this lesson.

Do not make the mistake of breeding one of the rare varieties on the theory that there would be little or no competition at poultry shows, thereby making it easy to win. In that case, suppose you do win. Who cares? No one really cares except those breeding the same variety. They care because they want to buy stock, eggs, or chicks from the strain that wins. This being a fact, it is then self obvious, the smaller number of breeders of your variety there are the smaller is the number who may be interested in buying some of your stock or eggs.

True it is, that new varieties have been taken up by some breeders who have made fortunes from them. Always in such cases one of two things made up the "stage setting" at the beginning. First of all, the "new variety" must have had points of practical value, and then, also, it must have been in the hands of a breeder who had the ability of a real "promoter" with the necessary capital to back the promotion of this new variety through the sheer weight of well thought out advertising, exhibiting, etc.; or a new variety having real practical merit may have been taken up by some breeder who worked "slowly and carefully." After many years of hard, constant and consistent work he may have lived to see the day his breed became popular and bred by many in all parts of the land. Then and not until then was there a good business in that variety, and, as a rule, by that time some breeders more gifted in advertising and selling by mail would take up the variety and get the largest share of the business.

In selecting a variety take a common sense view and select one which seems to offer opportunity for good business. Good business means a greater profit to you. From either the standpoint of egg production or of market value, or of a combination of both, select a variety which is practical and popular. One of the varieties widely bred by the farmers of your locality, county and state can be counted popular and practical and a very good selection for you to make. Your first demand for breeders or hatching eggs very likely will come from neighbors, farmers, and breeders from towns and cities located not far from you.

The surest way to make a success in Standard-bred poultry is to breed a variety whose utility qualities will support you while you are building up a trade in breeding and exhibition stock, baby chicks and hatching eggs.

If you can put a few crates of broilers on the market in early spring, or at least one case of fresh eggs each week during the winter, your chances of losing money during the first few years of your poultry career will be greatly lessened.

Many failures in Standard-bred poultry have resulted from the breeder jumping from one variety to another. Consider the points brought out in this lesson, and, with these thoughts in mind, select a variety you will like and then stick with it. Specialize and become a master of your specialty.

## EGG PRODUCTION IMPORTANT

For several years a rather common idea prevailed that Standard-bred or exhibition poultry would not produce a profitable number of eggs. This may be true in the case of some strains or families of any variety. As a general rule it is not true. It has been proven in many ways and instances that some of the most noted families of popular varieties, from an exhibition point view, have produced several birds which have made exceptional egg records under the trap-nest.

In the American Egg Laying Contest of 1918, conducted by the School, there were eighteen popular varieties represented by three pens of six pullets to the pen. Each pen was bred and raised by a well known and successful breeder of Standard-bred poultry. By the middle of February the majority of these females had produced a very profitable number of eggs in spite of the coldest winter of the past twenty-five years.

This was not always the case. Up to the years of 1912 or 1913, with an exception here and there, breeders did not pay the attention to egg production that they paid to color and plumage, which oftentimes resulted in many birds being bred that were poor producers themselves and doubtless were bred from poor producers.

Due largely to the gradual increase in price of feeds and the corresponding price of market eggs more importance has been given to egg production by all poultrymen. This was also encouraged by the many egg laying contests held throughout the country. As a result of this, the purchasers began to inquire of the breeder for **good Standard-bred birds, bred from good layers or selected with egg production being especially kept in mind.**

Again, as the price of hatching eggs became higher, the breeder recognized that the selling of hatching eggs presented the greatest margin of profit in the Standard-bred poultry business and, therefore, he began to take steps to prevent the necessity of returning money, received from customers for hatching eggs, because the output from his good matings were already sold or booked up. This led to the discovery that with proper selection, mating, pedigree, hatching and marketing, he could breed up the laying qualities as well as Standard qualities. Those who have seen the handwriting on the wall have been doing this very work. More will either do so in the next few years or will be forced out of business.

The so-called fanciers or breeders who devote their time solely to breeding for feathers and shape will grow fewer in number each season. Some few will continue along that line indefinitely, but they are breeding poultry as a hobby and not as a business. A hen that lays but very few eggs is practically valueless, no matter how beautiful or close to Standard requirements her shape or plumage color might be. Breed for a combination of Standard qualities and egg production. You may be forced to eliminate many good exhibition birds from your breeding yards, but do it and leave no middle ground in doing so. This method will win the largest cash reward in due time, and, if possible, keep yearly trap-nest records of your best Standard fowls. Keep them accurately. Do not cheat either yourself or your customers. Feel as proud of good laying records as you would of a good show record and then do not hesitate in letting prospective customers know abut them.

## MAKING A START

Above all things, start modestly. "Learn to creep before you try to walk," is splendid advice when applied to the Standard-bred poultry business. Do not try to carve out a niche for yourself in the "Poultryman's Hall of Fame" the first year. Fortunes have been lost in that very attempt. Men who would have made a success of the business, and who would have been a credit to the industry, have gone down to early ruin because they thought themselves capable of launching a big business the first season.

One of the beauties of the Stndard-bred poultry business is that you can start inexpensively, and can conduct it as a "side line" while pursuing some other vocation. That is exactly what you shoud do in beginning this business. In this way you do not run any such risks as you would if you were to suddenly "burn your bridges behind you" and launch out into the poultry business, expecting it to make you a living from the start. You do not jeopardize your future by subjecting your business to the strain of supporting you before it is able to do so. Again, by starting in a small way you have an opportunity to learn the myriad details of the business while it is yet in an experimental stage. A mistake made on ten hens is not nearly as serious and far-reaching as though it were made on a hundred or a thousand hens.

The cheapest way to start is with eggs for hatching or baby chicks. It will probably be cheaper and more satisfactory to buy baby chicks, provided you can secure them in your variety at a reasonable price, and provided they do not have to be shipped more than a twenty-four hours' journey. By purchasing baby chicks you relieve yourself of the necessity of buying an incubator, and, also, of getting used to running it when it is filled with eggs which have cost you good hard money. Whichever plan you use in starting, make certain that you get eggs, chicks, or stock from a good laying, healthy strain of chickens. If you do not know where to buy, find out from some breeder or authority in whom you have confidence. Do not be deceived by enticing and cleverly worded ads unless the breeder has the stock to back up his statements.

As to just how one really should make a start in Standard-bred poultry, much depends upon the season or the time of year. If you can afford it, the quickest and most satisfactory way to start is to buy a pen of from four to ten females, one year old hens preferred, and a male bird from a good reliable breeder. Choosing the source of your foundation to the flock of Standard-bred birds you propose to breed is of vital importance. Thorough investigation should be made of the Standard and egg-laying qualities back of the strain or family bred by each breeder whom you have under consideration at this time.

By purchasing a small mating of the very best you can afford, you immediately begin to derive an income from your poultry breeding operations. You ought to be able to sell nearly enough eggs for hatching the first season to pay the cost of the pen, besides raising a nice flock of young stock for yourself.

Take no chances in buying baby chicks or eggs. Buy them from a breeder known to have special selected matings, who has a reputation for being painstaking in selecting his breeding stock. Above all, satisfy yourself that his fowls have all the desirable qualities you wish to have in your own flock. Naturally you should select a reliable breeder whose reputation for honesty and fair treatment is above reproach. As a rule, it is not necessary to send your order a thousand miles to find such a flock or breeder. You can usually find them near your own home, at least in your state or adjoining states, and thus save express charges and chances of loss by long shipments.

If you are just starting with poultry, without having had a great deal of experience, it would doubtless pay you best during the first year of your work to try all three methods of getting a start and the quality which you desire. The second year of your work will be time enough to select the best birds you raise and start to breed a carefully selected bred-to-lay Standard flock of your own. If you can buy some baby chicks to arrive at about the same time that eggs from the birds you have bought are to hatch, it will insure your chances for success in raising a nice number of good youngsters. On the other hand, instead of placing all your chances on baby chicks alone, it is well to produce or purchase some good hatching eggs yourself and incubate them, for fear the baby chicks might be lost or become weakened by shipment. But remember, above all things, in making your start it is better to strain a point and get the very best breeding stock possible. The time you will save in the long run by making a wise purchase of this sort will more than compensate you for the difference in the original cash outlay.

## THE SALES PROBLEM

Assuming that you have made a successful start with the variety of your choice, and having your first surplus birds on hand, your next problem is the "sales problem." You are ready to begin the task of building up a trade. Your entire future hinges on your ability to dispose of your surplus at a profit. Perhaps the solution of the problem looks easy. Possibly you think all that you have to do is to advertise, and customers will flock to you from every direction. Thousands have thought the same thing, indeed have tried it—but the customers failed to materialize. Why did they fail? Simply because the poultryman had failed to grasp the situation. He did not realize that the solution of the sales problem means more than merely advertising, and that advertising itself is one of the most complex problems of the age.

## ADVERTISING

Advertising is the foundation of the modern business world. Advertising has created fortunes, and fortunes have been lost by the unwise use of advertising. In this vast country of ours with its hundred and ten million population, the possibilities of judicious advertising are almost unlimited, but it must be judicous. The best of judgment must be used. The experience of others must be studied, and their mistakes profited by. Hundreds of poultrymen have built up profitable businesses by the proper use of the power of advertising, and you can do the same now.

## HOW, WHEN AND WHERE TO ADVERTISE

One of the most important problems which the Standard-bred poultry breeder has to face is that of knowing in whose publications to advertise. Modern advertising is a cold blooded business proposition. It should be looked upon as an investment, not as a sort of necessary expense. The poultryman's advertising is not "general publicity" advertising, such as is used by large manufacturing firms to induce the buying public to purchase their goods at the nearest drug, grocery, or hardware store, as the case may be. The poultryman sells direct, and his advertising must yield direct returns. For this reason, he must select his advertising media with greatest care.

## THE LOCAL PAPER

The advertising which the average beginner does is to insert an advertisement in his local newspaper. This is a good thing to do. "Charity begins at home." The worst feature about advertising in your local newspaper is the fact that your friends and neighbors, except in very rare instances, will not pay what your stock and eggs are worth. They seem to thing that if they are paying you a slight advance over the current market quotations, they are doing well by you. "A prophet is not without honor, save in his own country." For the selling of utility cockerels at two dollars each, or the selling of eggs for hatching from the range flock at a dollar and a half per sitting, the local newspaper has a logical place. But one cannot hope to build up much of a trade by its use alone.

## THE FARM PAPER

The leading farm paper which circulates in your own state and adjoining states should undoubtedly be made use of in building up a trade in Standard-bred poultry. Scrubs are rapidly disappearing from the modern farm. The average farmer, even though he may keep Standard-bred poultry, is a busy man with little time for reading. Poultry is strictly a side line with him. His "hen fever" has not yet reached a point where he feels impelled to subscribe for an exclusive poultry journal. He will make a good customer for medium priced stock and eggs, but in order to reach him you must advertise in his favorite farm paper. Most farm journals have a special rate for poultry advertising which is slightly lower than the regular rates. For advertising poultry in the farm papers, classified advertising is usually considered preferable. No display type is used in classified advertising. The advertisements are classified according to the variety, so that the busy farmer who wants to buy a Barred Rock cockerel, for instance, turns to the Barred Rock heading in the classified advertising department, instead of having to search through the whole paper for your ad. Classified advertising is paid for by the word, numbers and initials counting as words. Do not make the mistake of using too few words. It is often false economy. Use enough words to describe what you have for sale in a way that will create a desire to buy on the part of the reader. As suggested above, the farm paper offers a good outlet for your medium priced stock and eggs. A profitable business can be built up by its exclusive use—but **not as profitable,** as if, in addition, you make use of one or more good poultry journals.

## THE POULTRY JOURNAL

A "class publication" is a journal or magazine devoted to the interests of one particular industry or business. It naturally appeals to and attracts as its readers those who are particularly interested in the profession, business or industry of which it treats. The lawyers have their special publications through which they keep in touch with progress and current events in the legal world; so have the doctors—and every other profession. These journals and magazines are known as "class publications." A journal devoted exclusively to dairying is a class publication. Likewise, a poultry journal is a class publication. If you had just published a book describing in technical language an important medical discovery, which was selling for twenty-five dollars a copy, you would expect to secure best results by advertising it in a medical magazine, rather than in a dairy paper or poultry journal. For exactly the same reason, if you are setting out to build up a permanent and profitable trade in Standard-bred poultry, you should advertise in one or more exclusive poultry journals. The man and woman who reads them are especially interested in poultry. They appreciate that elusive thing called "Quality" in a bird and are willing to pay for it. With a few years of experience you should be able to produce birds that are really worth from $5.00 to $25.00 each, and eggs for hatching that are worth from $3.00 per sitting to a dollar each. But you cannot expect to obtain these prices by advertising in the farm papers. You must look to the poultry journals to put you in touch with the specialty breeders and fanciers of your variety who are willing to pay a fair price for the results of your years of study and experience.

## WHICH POULTRY PAPER?

When you take your birds to a poultry show, and there encounter the persuasive representatives of twelve or fifteen poultry journals, you are immediately brought face to face with the question: "In which of these journals will it pay me best to advertise?" Upon your intelligent answer to that question will depend, to a considerable extent, your ultimate success. Intelligent advertising pays—always! Any other kind does not, except in very rare instances.

Do not take snap judgment in this matter of deciding in which journal you will place your advertising. A good many shrewd poultrymen refuse utterly to sign an advertising contract at a fair or poultry show. Why? Simply because if they do, they are too likely to be influenced by the eloquence of some especially persuasive poultry journal representative, rather than by quietly weighing the respective merits of the different publications and deciding upon the one which seems most likely to bring the best results. When you have become somewhat acquainted with the relative qualities of poultry papers it usually pays to "fix up" your yearly advertising contract with the representative of the papers you have chosen at the show where you are exhibiting. The representatives like this, and a more extended mention of your exhibit is usually made in the published report of that show.

What points, then, shall we consider in selecting our advertising medium? What tests shall we apply in order that we may feel fairly certain that out of the hundred poultry journals now being published in America we are selecting the one best adapted to our use?

In the first place, preference should be given by the young breeder to his own state paper, or the one circulating most in his own immediate territory. You are still showing and winning at local shows. The largest show you make is the State show of your home State. Winnings at such shows are of the greatest advertising value to you nearest home, where the greatest general interest in the shows themselves is taken. Again, your reputation as a breeder of the variety of your choice must begin at home and gradually spread like the waves in a quiet pool of water into which you toss a stone; another reason why you should advertise first in your State paper. If you commence advertising in a large poultry journal of large circulation, the competition will be too strong for you. You will find that too many breeders of your variety are better known than you are, and that, therefore, they will get the orders while you "hold the sack." When you begin to win at National Shows like Chicago, Indianapolis, Philadelphia, Boston, Madison Square Garden, St. Louis, Portland, Oakland, Los Angeles or Kansas City, thereby achieving a National reputation, then will be the proper time to begin to use the large National poultry journals in addition to those which circulate principally in your section of the country.

There is still another reason why the poultry journal, the bulk of whose circulation lies nearest you, should pay you best. The average person, in buying either eggs, baby chicks, or stock, keeps one eye on the express charges. If he can get what he wants near home, he would be foolish to send to a distant state, thereby doubling the transportation charge. If you live in Minnesota, and have not yet acquired a National show record or reputation, you could hardly expect a Texas poultry journal to prove a profitable advertising medium, and vice versa.

From what has been said above, it has not been intended to convey the impression that you should advertise in the journal which circulates nearest you **solely** for that reason. There are other requirements which must be met, other conditions which must be taken into account, before you make your final decision. The paper selected must be well established and in good repute. Subscribers must have confidencce in a publication before they will buy of its advertisers. This not only takes time, but it requires the services of a strong man in the editorial chair, a man of unquestioned integrity, a skilled diplomat, a "live wire," and last, but not least, a thorough poultryman. A poultry journal is the reflection of its editor. You cannot expect a poultry journal to make good as an advertising medium unless it has a "backbone," unless it is the exponent of a "square deal," and unless its pages are filled with something more than long-winded "puffs" for prominent advertisers, regardless of the quality of the stock they are offering. A new poultry journal, unless it has a strong organization behind it, and unusual efforts are put forth, is at a distinct disadvantage on account of the lack of prestige, and also on account of the lack of circulation.

Speaking of circulation, it is another very important point to be considered. Other things being equal, the relative value of two poultry journals from the standpoint of the advertiser is in exact ratio to their **actual paid** circulation, not what they claim their circulation to be. If your poultry journal publisher is honest, he will gladly furnish you with a sworn detailed circulation statement, and he will back it up with a copy of the Post Office mailing receipts. If he refuses to do it, Beware! The writer knows of a poultry journal which claimed thirty thousand circulation. A little quiet investigation at the Post Office revealed the astonishing fact that beween seven and eight thousand copies per month were being mailed! Small wonder that that particular poultry journal has not made good as an advertising medium. It is now out of business. It failed and its publisher lost a great sum of money. Advertising rates should be based on real circulation, not hot air. In order to merit your patronage your State paper should be able to show an average paid circulation of not less than ten thousand copies per month and the short-time display advertising rate should not exceed two dollars and fifty cents per inch for such a circulation.

As soon as you have perfected your strain or family of fowls so that a fairly large per cent of the stock raised each season are very good birds, and just as soon as you have made a "fair" winning at a National show, then a small advertising campaign should be started in a poultry journal of National reputation. From year to year your "National'" advertising can be slightly expanded in ratio to your increased production of "more and better" birds.

## QUALITY IN CIRCULATION

By quality in circulation we have in mind the class of people who are the subscribers for the magazine, journal or paper; also the methods pursued by the publisher in obtaining a good circulation. A large amount of circulation is desirable, but quality circulation is absolutely necessary if your advertising is to pay. A large subscription list, made up of people who actually pay the advertised subscrition price for a publication because of their interest in the class of subjects of which it treats and because of the interest and value of its contents to them, beyond question would constitute quality circulaion. During recent years, the largest advertisers, and poultry journal publishers as well, have discovered that quality in circulation is far more important than quantity. Prior to this era there existed a rather common practice of securing circulation or subscribers through the services of professional subscription solicitors at fall fairs and winter poultry exhibitions. Such solicitors made themselves more or less obnoxious in the aisles of the poultry exhibition. They became such a pest that, in most instances, they have been barred from show rooms and fair grounds. The prevailing practice in these days is for publishers to have clean-cut, intelligent young men and women, who build neat and attractive booths along the side walls of such exhibitions and present the merits of their publication to interested visitors passing by. Subscriptions obtained under this method are "interested subscribers," and are of extreme value to the advertisers in that publication. Other poultry paper publishers, in years past, obtained large subscription lists by permitting publishers of daily papers and farm journals to offer a subscription to their poultry paper as a premium to all who subscribed for the farm magazine. In short, the subscriptions to the poultry paper were given away, or at least furnished for a sum representing but a small per cent of the advertised subscription price of the poultry journal. This method produced a very large subscription list, which could not be looked upon as quality circulation.

The leading poultry publications of this day use only high-class, intelligent young men and women solicitors, and, in addition, procure the greater portion of their subscriptions through direct advertising in magazines and other publications, and through circulars and letters sent from their office direct to poultry raisers. Papers which have pursued this policy have grown in strength through the large advertising patronage they have been able to command, all because of the fact that they had quality circulation. It is a very safe rule to follow, that the publications in a given territory, which carry the largest volume of breeders' advertising month after month and year after year, are the ones which actually pay the advertisers the best.

## YEARLY ADVERTISING

It is necessary to creep before walking, and to walk before running. Also, it is necessary to be introduced to the poultry raisers of a given territory, at least for a reasonable period of time, before you can expect a very large per cent of them to place their orders with you for stock, hatching eggs, or baby chicks. There is scarcely a business of any kind which does not have a busy season and a dull season. This is true in the poultry business. But we do not expect our clothing or dry goods merchant to pull his shades and lock his doors during the dull season of the year. We expect to find our coal man on the job in the summer when it is 106 in the shade. We would be amazed if the great railroads stopped running passenger trains during the season when travel is light. The same argument holds true in advertising poultry. You should keep your advertisement before the people 365 days in the year. Do not lock your door and pull your curtains during summer and fall. Furthermore, the average poultry journals have two sets of rates by which they charge for the space you use for advertising. One set of rates is known as the "short term rate"; the other set is known as the "yearly rate." Let us take, for example, a total of twelve inches of advertising to be used within one year. We will assume that the short term rate of a given publication is $2.80 per inch, while the yearly rate is $2.25 per inch. Under the twelve-inch yearly contract, you could schedule your space something like this: Use one-half inch in June, July August, and September; one inch in October, November, and December; two inches in January and February; one inch in March, April and May. This will total twelve inches and will cost you an average of $2.25 per month, or a total of $27.00 for the year. Now let us assume that you were to use on the short term rate a one-inch ad in October, November, and December; a two-inch ad in January and February; and a one-inch ad in March, April and May. This would be a total of ten inches used during the period covering eight months. The ten inches at the short term rate of $2.80 would have cost you a total of $28.00, or an average of $3.50 per month. Thus you will see that with the yearly contract and the lower rate your advertising will have cost you $1.00 less, and you have the advantage of a half-inch of space during June, July, August, and September. It will always pay you to analyze the rates of every publication in the above manner. Bear in mind, also, that your fall, winter, and spring business will be better on account of having your ad before the people the year around.

## DISPLAY VS. CLASSIFIED ADVERTISING

Having decided in which poultry journal we will advertise, we must next decide whether we will use display advertising or classified advertising. Perhaps most beginners commence their poultry journal advertising with a thirty-word ad in the classified department, running this about three months during the cockerel selling season, or about three months during the hatching season. Classified advertising has the advantage of being cheap. In reality, although it costs less for the space consumed than display advertising, that is the most that can be said in its favor. For the small back-lot or side-line breeder, with but half a dozen surplus cockerels, or six to ten sittings of eggs to dispose of, a classified ad in a state poultry paper, or a small classified ad in a nearby journal, is the logical campaign for disposing of his stock. But for the breeder desirous of building up a trade, who wants to "get somewhere,' who is anxious to achieve a state-wide, sectional or national reputation, and who desires to build up a permanent and profitable trade in Standard-bred poultry, the wisdom of using classified advertising in poultry papers is doubtful, except in the case of reinforcing his general advertising campaign. Classified advertising is the best method of advertising poultry in farm papers. As a rule, however, sales obtained in this manner are for low-priced hatching eggs or breeding stock, and the same is true in the case of classified advertising in poultry journals. It is well to remember that all birds we raise, even from our best matings, are not on a par in individual qualities. This is true even among six full brothers. Two cockerels may be worth but $3.00; two may be worth $10.00; one may be worth $15.00; and another one, $25.00. You can safely expect to get in touch with the class of buyers who are willing to pay from $5.00 to $25.00 through display advertising in poultry journals; while the class you get in touch with through classified advertising in farm and poultry journals will seldom pay to exceed $3.00 and $5.00 for cockerels.

Advertisers buy among themselves, and those who want the best and are willing to pay for it are very often progressive breeders who use display advertising space themselves and seldom, if ever, read the classified columns. Then, again, just as long as you remain strictly a classified advertiser you are bound to be regarded as "small fry" by the breeders in the poultry world, the very class you must get out of as soon as you can. It is very well to start with classified advertising during the first year, but as soon as you are confident that you have some good matings and the experience and equipment to permit rearing to maturity twenty-five to fifty or more birds which will be worth a good five dollars on the average, then it is well to place a small yearly contract for display advertising with the poultry journal you have selected. Don't wait until your surplus cockerels and pullets are matured and you are anxious to dispose of them to make house room before you start your advertising to sell them. Don't expect to place an ad in the paper today and begin receiving customers tomorrow. You might have that experience, but it would be an exception and not the rule. Start your advertising at least two or three months before you expect to do much business, and then don't expect to do a great deal. It is just as important to begin building your reputation, to begin getting your name as a breeder of a certain variety before the people at the start of your poultry career, as it is to begin improving and working to rear good quality in birds.

By the term "display advertising," used above, is meant that style of advertising which is set up in display (black-face) type. The purposes of display type are, first, to attract the attention of the reader to the advertisement; and second, to emphasize the most important points in the advertisement. Display type varies in size from very small to very large. Several sizes of a black-face letter "A", in display type, are shown below.

AAAAAAAAAAAAAAAAA

There are almost numberless styles of display type, the details of which it is not necessary for anyone but the printer to know. Display advertising is measured by the **single column inch.** That is, a one-inch display is, normally, an advertisement one inch deep and one column wide. All standard columns, whether in newspapers, farm papers, or poultry journals are thirteen ems, pica, wide (two and one-sixth inches). In practice, a one-inch ad, for instance, may extend only across one column, or it may extend across two columns. If it extends across two columns, it will be only a half-inch deep, thus giving you the same amount of space as though it only extended across one column and was an inch deep. Double column advertisements are more popular than single column advertisements because there is more room for the display heading. The two advertisements shown below are both one-inch advertisements, one being a one-inch, single column advertisement, and the other a one-half inch, double column advertisement.

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**WHITE PLYMOUTH ROCKS**

**EGGS FOR HATCHING from matings of pure white, large bone, fine shape birds, at from $1.50 to $2.50 per sitting. Write for free catalog giving full information.**

**MRS. C. A. LEMLEY, R. F. D. No. 8 Wyaconda, Wis.**

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**White Plymouth Rocks**

**EGGS FOR HATCHING**

*from matings of pure white, large bone, fine shape birds, at from* $1.50 *to* $2.50 *per sitting. Write for catalog giving full information.*

**MRS. C. A. LEMLEY**

**R. F. D. No. 8 Wyaconda, Wis.**

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There are numerous advantages of display advertising over classified advertising. They may be briefly mentioned as follows:

First: The very fact that you are a display advertiser adds to your prestige—gives you a standing in the poultry world which you would not enjoy as a classified advertiser. This helps secure some good customers.

Second: As a display advertiser you can use illustrations made from a good photograph of one of your best birds as a means of attracting attention to your ad and of display type to drive home your message.

Third: Display advertising is distributed through the paper along with the reading matter so that it is more laible to be seen.

Fourth: In practically all poultry journals display advertisers are entitled to have their winnings at the various fairs and poultry shows published free of charge, together with free reading notices and illustrations of their birds. This supplementary service is exceedingly valuable. The amount of it which you are entitled to is in direct proportion to the amount of advertising space which you use.

## AMOUNT OF ADVERTISING TO USE

Granting that we have decided to use display advertising, the next question is, how much space shall we use, and when shall we use it? Let us answer the last question first. If you will look through the files of any of the leading poultry journals, you will be struck with the fact that the leading poultry breeders of the country, men whose standing in the poultry world is unquestioned, advertise the **year around. It is one of the secrets of their success!** Some well meaning people assert that these leading breeders advertise the year around because they have plenty of money. They would **be nearer the truth if they would** turn the statement around and say these men have plenty of money **because they advertise the year around!** That "the constant dropping of the water wears away the hardest stone" was never more true than in the advertising field. The readers of the paper will become accustomed to seeing your ad in it, just as you become accustomed to the familiar faces in your home town. Through the ad they become acquainted with you. By a well known psychological law, the impulse to buy is strengthened. In other words, the effect of advertising is cumulative. It "piles up" from month to month. If you allow your advertisement to drop out during the so-called "dull season" you lose this valuable cumulative effect—you lose far more than you save. Someone has well said that "insistent, consistent, persistent advertising is what pays." Let us not make the mistake, then, of proving ourselves "penny wise and pound foolish" by only advertising part of the year. When we start we must stay by it until the goal of success is reached.

The amount of space to be used during the year will depend, of course, upon the amount of stock and eggs which you have for sale. Be conservative. Over-advertising has spelled RUIN for many a young breeder whose ambition to make a big showing ran away **with his judgment.** One of the besetting sins of many poultry journal advertising solicitors is that of urging the prospective advertiser to contract for more space than he really ought to use. Even from the standpoint of the poultry journal, the policy is very shortsighted. In order to enjoy any lasting career of usefulness a journal must bring satisfactory returns to a large majority of its advertisers, and the overloaded advertiser is rarely a satisfied advertiser. A poultryman would be foolish to contract for two hundred dollars' worth of advertising space if he had only a half dozen birds to sell, or a single breeding pen from which to dispose of eggs. Many poultrymen are ruined because they spend more in advertising than they could possibly receive by selling their entire limited supply of stock, eggs, or chicks. A lot of money in advertising, and a lot of orders, without a lot of stock and eggs to fill the orders, is a waste of money.

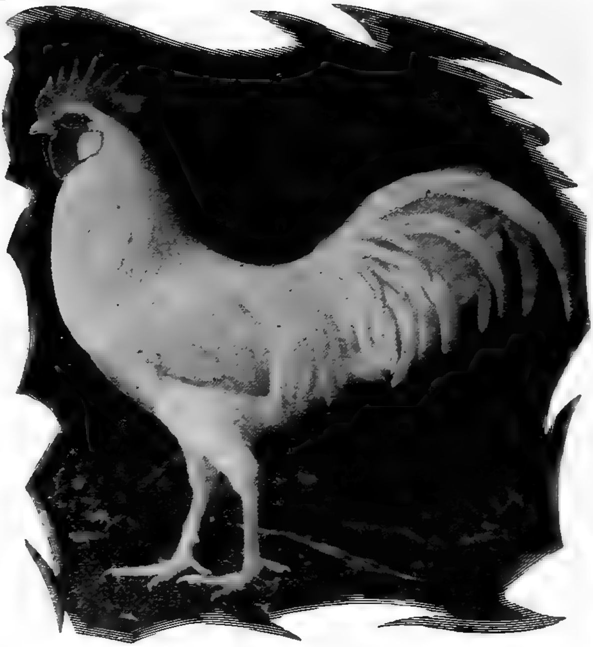
## PAYING CASH IN ADVANCE

One of the best safeguards against over-doing this matter of advertising is to adopt the policy of paying for it, by the year, **cash-in-advance.** Too many breeders are dealing strictly in "futures"—they are gambling, when they contract for their advertising space. They find the poultry journals glad to extend credit. They figure on paying for their advertising from month to month, out of the proceeds of said advertising. If, perchance, their dreams do not come true and they are unable to pay their advertising bills, the journals put them in their "dead-beat" list—they are ruined. How much better would have been their chances for success if they had used less space and paid for it cash-in-advance! Paying cash-in-advance is good business from any standpoint. It not only helps to keep you from using too much space, but it gets you a place very close to the heart of the poultry journal publisher—an asset with a real dollars-and-cents value to any ambitious poultryman. You can easily increase your space at any time that your sales justify it. Again, by paying for your advertising a year in advance, you will be allowed a discount for cash ranging from ten to sixteen and two-thirds per cent, an item well worth looking after. You will also save the time and trouble of sending in the monthly payments. It is hard to lay down any general rule governing the amount of space to be used. "Circumstances alter cases"—and circumstances and conditions vary greatly. Roughly, it may be said that the advertising appropriation should not amount to more than twenty, nor less than ten, per cent of the gross sales. Your first years advertising will be the most expensive in proportion to the amount of sales which you make. Advertising in a poultry paper is just like moving into a new community; it takes time to get acquainted, especially to get acquainted to the point where the people are willing to trust you in business dealings. The longer you advertise, the smaller should be your relative advertising cost. "A satisfied customer is the best advertisement" and the larger the number of your satisfied customers, the greater will be the amount of business which will come to you unsolicited.

In most poultry journals the smallest annual advertising contract which you can take out is twelve inches, an average of one inch per month. However, it is neither necessary nor wise to use the same amount of space every month in the year. More should be used during the late winter and early spring, the height of the poultryman's selling season, and less during the summer. Assuming that you have decided to use twelve inches of space during the year, the following schedule is suggested as a good one: January, 1½ inches; February, 1½ inches; March, 1½ inches; April, 1 inch; May, 1 inch; June, ½ inch; July, ½ inch; August, ½ inch; September, ½ inch; October, 1 inch; November, 1 inch; December, 1½ inches. If more space is used during the year, the relative proportions, under ordinary circumstances, would remain about the same. If you have a comparatively small amount of stock for sale, but are in a position to take care of a good trade in eggs for hatching, you should use your largest space during January, February, March, April, and May. If you have a lot of stock to dispose of, you should begin using your largest space as early as November.

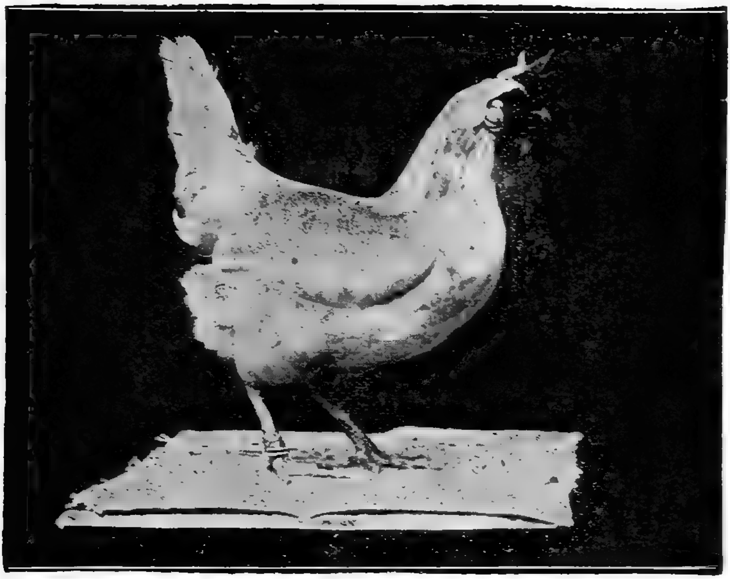
## SNAPSHOTS AND PHOTOGRAPHS

It is generally considered that "seeing is believing." Next to seeing your poultry, the greatest appeal to prospective purchasers is illustrations made from clear, bright, clean-cut snapshots or photo-



This shows a White Leghorn male that was well posed when photographed. Notice how his foot and leg farthest from the camera was stepping forward. His head is in about the correct position; also, his saddle and tail carriage is nearly ideal.

grahs. You must develop the knack of "taking pictures" yourself at home. The youngsters should be snapped at different stages and ages of their development. Interior and exterior views of poultry houses, good fencing, and equipment, are also interesting illustrations when used on your letter heads, circulars, mating list, or catalog. Good illustrations are a wonderful help towards getting the order. They are convincing. They show beyond the question of a doubt, that you, in reality, are in the business and not merely "huckstering." You must learn to take photographs of individual birds, posing them to stand in as nearly a natural and ideal a position as possible. Such photographs should be taken in a strong light, and, if possible, it is best to take them in the sunshine. Modern kodaks and cameras cost but little, are a source of much pleasure in one's home, and are of great value to you in your work of building up a trade in Standard-bred poultry. You must not try to have halftones made from every photograph you take. Only such photographs as you need to properly illustrate your advertising printed matter from year to year, or for illustrations in articles or write-ups in the papers carrying your advetisements, are all that you can afford to have halftones made from. A small amount of money invested in halftones made from original photographs each season is a good investment in building up your business. Unless it is of some permanent building or of some particularly noted prize-winner, it is best not to use the same illustration year



This photo shows a White Leghorn female which, although posed better than the average, is still very poorly posed. She is not standing "easy" or natural. Her legs are cramped at the knees or hock joints. She shows very little thigh shape and thus appears too short or too low stationed. Her body is tilted too far forward and too low, making her back line slant upward and showing her tail "pinched" and carried too high.

after year. A small proportion of new hafltones, made from original photographs, should be used for illustration purposes each season. Halftones can be made from good photographs by any engraving company.

## HOW TO WRITE A GOOD ADVERTISEMENT

There are five points to a good display advertisement. They are as follows:

(1) The Display Heading, sometimes called the "catch-line";
(2) The Body of the Advertisement;
(3) The Signature;
(4) The Illustration;
(5) The Border.

**The display heading** is the beginning of the advertisement. It usually takes the form of a line of display (black-face) type, running the length of the advertisement. Its purpose is, chiefly, to catch the attention of the reader, and arouse his interest to the extent that he will read the balance of the advertisement. This display heading may menion the variety advertised, and tell something about them. Quite a common custom, and a good one, is to mention the owner's' name, as, for instance, "Jones' Farm Houdans" or, "Smith's White Leghorns." This associates your name with your variety, and, as your reputation increases, there will be a constantly increasing tendency, on the part of the buying public, to think of you whenever your variety is mentioned. Another excellent idea in display headings is to link the name of your particular strain with that of your variety. "Ringlet" Barred Rocks and "Crystal" White Orpingtons are familiar examples of this practice. "Ringlet" is the name of the particular strain of Barred Rocks, while "Crystal" is the name of the strain of White Orpingtons. Do not make the common mistake, however, of giving the other fellow's strain a lot of free advertising. By careful selection and line-breeding originate a strain of your own, select a suitable name and advertise it at every opportunity. When you are just beginning to advertise it is a good idea to use the name of the strain from which your stock came until you have established a little reputation for yourself.

**The body** of the advertisement contains your message. It is the vital point of the advertisement, the part that gets you the inquiries. It should be concise, to the point, and very carefully worded to convey exactly the impression which you desire to make. It should tell the truth and tell it in a way that will convince the reader that it is the truth. It should contain the strongest reason that you can think of—as to why the reader should buy your stock, baby chicks, or eggs rather than those of your competitor. If you live on a farm, mention the fact that your birds are farm-raised; it is an argument in your favor. Prizes won at fairs or poultry shows should be mentioned; at least, the important prizes. You need not go into complete detail. You must judge by the size of the ad for which you are preparing the copy. If your birds have stood well in some egg laying contest, that is a selling point which you should not overlook. Do not try to say too much in a small space. It is both poor economy and poor advertising to crowd so much into the body of your advertisement that you do not have room enough left for a good display heading. Tell just enough in your advertisement to arouse the reader's interest. Promise to tell him the rest in your letter, catalog, or mating list.

**The signature** of the advertisement is the last line. It should contain your name, address, and the "key." The "key" of an advertisement is a device used by all up-to-date breeders. It is usually a part of the address, and is different in each journal in which the advertisement is running. In this way you can tell which journals are paying you, and which are not. Suppose you live on Rural Route No. 1, and are advertising in three poultry journals, you could "key" your advertisement by making your address in one paper, "Route 1, Box A"; in the second paper, "Route 1, Box B"; and in the third paper, "Route 1, Box C." You can then tell by the address on the envelope which paper brought that inquiry or customer, as the case may be. By keeping a daily record of these facts, at the end of the year you can easily tell "the results" each paper has brought you. You will know if it has made you money, and vice versa. If two papers "paid" and one did not, you can "keep out" of the poor one the next season and "try out" a new third paper. Your mail carrier knows where you live, and you need not worry about his leaving part of your mail at the wrong place.

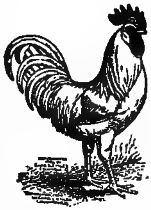
If you have a Post Office box—say Box 16—a very good way to "key" your ad is to make box numbers in your advertisements, "Box 16A, 16B, 16C," etc. Other ways of "keying" your advertisements will occur to you. The idea is to have some way of telling in which paper the inquirer saw your advertisement, in case he fails to mention it in his letter.

Occasionally you will receive an inquiry with no "key number" on it. The usual custom is to credit the non-keyed inquiries in proportion to those that are keyed. For instance, if you find that you have received six inquiries that were not keyed, you would be warranted in crediting the paper which brought you twenty keyed inquiries with four of those that were not keyed, and the other paper with the other two non-keyed inquiries. This matter of keying your advertising is a matter of tremendous importance in stopping your advtrtising leaks, and should not be overlooked.

It is not absolutely necessary for you to have an **illustration in your advertisement, nor to have a border around it. In very small** advertisements where it is necessary to economize space, the border, especially, may well be omitted. The purpose of both the illustration and the border are to give the advertisement individuality, to make it more attractive, and make it "stand out" from those around it. All advertisements an inch and a half in size, or larger, in order to give you the greatest possible amount of advertising value for your money, should have both an illustration and a border. The following two-inch double column advertisement contains a key and the five essential features—display heading, body, signature, illustration and border.

### A WELL WRITTEN ADVERTISEMENT

**"CRYSTAL" WHITE LEGHORNS**



**WIN AT CHICAGO** Our farm raised, trap-nested, selected, egg bred strain, won two first, one second, and two fourth prizes, in the face of hot competition, at this great national show. We breed the Single Comb variety exclusively for heavy egg production and best Standard qualities. Our matings this season include several

**HENS THAT LAID 212 to 253 EGGS**

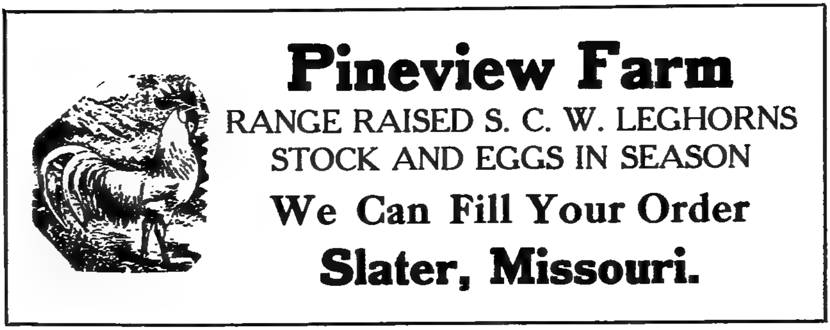
We can furnish developed, vigorous cockerels from these hens reasonable, quality considered. Eggs only $3.00 per 15, or $10.00 per 100. Description of matings, complete show record and our "Guarantee of a Reasonable Hatch" are all explained in our

**FREE** MATING LIST. WRITE FOR YOURS TODAY.
"A Pleased Customer or No Sale."

**PINEVIEW LEGHORN FARM** **Box 16 A** **SLATER, MISSOURI**

A great many attractive things are stated in the above advertisement, things which would tend to bring an inquiry from anyone wanting Leghorns. The Leghorns are farm raised, some are trap-nested, they have been selected and bred for egg production, several of the hens have made exceptionally high records, his birds have won first prizes in good shows, cockerels are for sale at a reasonable price, and satisfaction is guaranteed from any eggs which are purchased. You invite him to write for other literature and he is assured that he will be given a square deal. Do not promise any more than you can do and always do what you promise. Produce the goods and then go after the business in both letters and advertisements. Set a price according to the quality produced and you are almost certain to build up a nice business and net a handsome profit.

### A VERY POORLY WRITTEN ADVERTISEMENT



**Pineview Farm**
RANGE RAISED S. C. W. LEGHORNS
STOCK AND EGGS IN SEASON
**We Can Fill Your Order**
**Slater, Missouri.**

The above advertisement does not state a single fact that would attract anyone looking for White Leghorns, outside of the fact that the birds are range-raised. It is almost a waste of money to place an advertisement like that in any paper. The owner of the farm would no doubt blame the paper, and condemn advertising and the poultry business in general because he failed to get inquiries or make sales from such an advertisement. The advertiser himself is at fault. Get enough facts in your advertisements and your letters and your literature to make prospective customers feel that they must have some of your stock. You should state only facts in your advertisement, of course, but be sure you do get the facts included and then state and illustrate them in the most attractive way.

The Pineview Farm may have the greatest layers and the most attractive Leghorns in the world, but no one would ever know it from the above advertisement. Hundreds of poultrymen fail because of two facts, they raise the chickens and produce the eggs, but they cannot sell them because they do not advertise properly and because they do not use any judgment in answering inquiries after they are received. With attractive stationery, a neat little circular to enclose with each letter, and the facts properly told in their letter when writing about stock and eggs which they have for sale, and then by delivering the goods, it is possible for any man or woman to build up a successful business.

### COMMON MISTAKES IN WRITING AD COPY

Advertising space is costly, considering only the actual size of the space; it is worth the cost, because it is printed and mailed to thousands of readers.

Small breeders, especially, should refrain from an endeavor to "tell everything" in their ads. It is cheaper to mention a few concrete facts with the idea of creating a desire on the part of those who may read your ad to write for further information. You can then send him your circulars, mating list, or catalog, which is supposed to "tell the whole story" in detail.

Unless the price is very low never mention it in your advertising copy published in journals or farm papers. Even in the case of a "low price" or "Special Offer" we believe it better to mention it in those terms and so word the remainder of the ad as to invite them to send for further information. Further information can be supplied in detail, giving full argument about your stock and why it is worth the money asked. The chances of the purchaser's verdict being in your favor are much better, after he received this full and complete information.

Unless you are a very large breeder you cannot afford to buy advertising space large enough to permit a complete argument regarding the merits of your stock; therefore, it is better not to quote your prices. When the price is quoted the reader very often decides then and there whether to buy that which you offer. His decision has been rendered and very likely against you.

Very recently we noted in a leading poultry journal a small classified ad of a breeder who is practically unknown to the readers of that paper. In this small ad he offered hatching eggs at $5.00 per sitting and presented no argument regarding the quality of his stock, making no mention of laying ability or prize winning record. He may have the best birds on earth, but who knows it. No one can tell by reading his ad. The readers of that ad will not answer it. They will not be at all interested. Eggs offered at $5.00 per sitting with no argument as to why they are worth it will not be bought. The verdict is against the advertiser as soon as the ad is read. Such an ad offering eggs at $1.50 or $2.00 per sitting might, perhaps, induce a few to have written for further information on account of the cheapness of the eggs. A few sales may have resulted. When forced to use small ad space, make it tell facts about your stock only. Offer price, description and full information upon request. You can then go the limit with your arguments at a very small expense and your chances of getting the orders are much better.

## CHANGING COPY

Theoretically, your advertisement should be changed every month. Our largest and most successful advertisers rarely, if ever, run the same advertisement in two successive issues of any publication. "Variety is the spice of advertising." If the readers of a poultry journal find that your advertisement is the same month after month, they will cease to look for it or take any interest in it. On the other hand, if they find that your advertisement is different each monh, that in each issue you are advancing new selling arguments, they will instinctively become interested, and watch for your advertisement, with a constantly increasing number of inquiries as the inevitable result. If you cannot take time to see that your advertisement is changed every month, above all things else, see that it is changed often enough so that it is timely and seasonable. Do not let your "eggs-for-hatching" ad run clear into the following fall. It not only does no good, but it does you a positive harm in that it is an indication that you are not wide awake and progressive. Prospective buyers would, naturally, conclude that you were as careless in all your other practices with your poultry and they would rightly look for some more timely advertisement and some more careful and up-to-date breeder. "Eternal vigilance is the price of success," in advertising as in everything else. It is often wise to run an ad this month, change the copy next month, and the third month repeat the first ad, if it brought good results.

## THE POULTRYMAN"S TRAVELING SALESMAN

Every successful enterprise, every great business, which has to depend upon buyers living in a widely distributed territory, has to depend upon reaching customers and prospective buyers by sending out representatives of some sort. The big and successful factories, mills, packing plants and wholesale houses send out traveling salesmen to represent them, to talk up their products, and to land business for them. But the poultryman's traveling salesmen are his advertising columns. What business he makes for himself, the quantity and quality of trade he secures, his success or failure to a greater or lesser degree, depends upon the quantity and quality of advetrising space he takes and the judicious and persistent use of same.

There is just as much difference in the advertisements put out by poultrymen, just as much difference in their business getting ability, as there is difference in traveling salesmen as you meet them in the commercial world. Some are always at it, some make friends and bring business for the firm which they represent, some increase their sales from year to year, and some do exactly the opposite. Inasmuch as the advertising columns are the poultryman's traveling salesmen, and upon these he must depend largely for his business and his growth, is it not well for him to consider carefully the character of his ads, and the size and frequency of them? Commercial salesmen do not cover a territory and call on customers once and then quit, but they go month after month to the same customers. Learn a lesson from the big business firms of today, that are doing millions of dollars worth of business, which in some cases started with less capital than you have.

We know of a good breeder of Rhode Island Reds in this state. He breeds birds of high quality and shows and wins at good shows, and has for several years. But he has never taken a line of advertising in any paper of any description. He gets his orders from his nearby neighbors who know that he breeds good poultry, but they pay him only about $1.00 per sitting. He has not been able to sell enough to pay for the chick feed he uses each spring. He is now finding fault with the business and says nobody wants good poultry. He is a knocker on the business. Who is at fault? This man raises large numbers of chickens of high quality, but he has sent out no traveling salesmen. He has done no advertising. He has not announced to the buying public that he has something to offer. The result is that those who have sent out their salesmen have landed the business, sold their stock and eggs, and this poor fellow has produced a good product but nobody knows it.

The mere fact that you buy space does not mean much within itself. It is worth something to simply keep your name before the public. The page ads on the back covers of the Saturday Evening Post and the Ladies' Home Journal, which cost thousands of dollars for a single issue, very often only contain a half dozen words outside of the name of the firm and the picture of the product advertised. It is worth that amount simply to keep the firm's name before the public. If the poultryman would make his ads readable, word them in such a way that the readers would really want what he has for sale, and then illustrate his ad with a small cut of his variety of poultry or some attractive illustration that would be certain to attract attention, then this would be a salesman that would bring him some inquiries, at least.

The most successful poultrymen in America and throughout the world are those who send out these salesmen. They are the ones who do the most advertising and who make them readable, and who illustrate their ads. Do not forget, Mr. Poultryman, that the other fellow is in the business to win and that he will go after the business and get it if you do not make an effort to get your share of it. You will die of dry rot, weeds will grow up around your place and hide it from view, and yours will be a deserted poultry plant some day, if you do not awaken to your opportunity and get your share of the business at a busy season like this.

## FREE READING NOTICE

As has already been noted, practically all poultry journals are glad to co-operate with their display advertisers by publishing, free of charge, their winnings at the various fairs and shows, cuts of their prize winning birds, little "write-ups," calling attention to their advertisements, etc. Naturally the amount of free publicity which you will receive depends upon the amount of advertising space for which you are paying. Remember this, that the poultry journal publisher is a busy man. Furthermore, he is not a mind reader. If you want reading notices that are of real value to you, write him a letter giving him some data upon which to base a reading notice. Tell him how many chicks you have hatched from your best pen, which was headed by a certain winner at a certain show. Tell him how they are growing, and of their promise of quality, and any timely, truthful item of news such as these mentioned. The writer has known advertisers to feel that they were not getting all that was coming to them because they did not receive as many reading notices as some other advertiser using the same amount of space. Nine times out of ten, they had only themselves to blame. They failed to get the "write-ups" because they failed to ask for them, or failed to prepare and send them to the publisher, or failed to furnish him with information from which to prepare copy for a "news note" or "write-up."

> "White Leghorn breeders will be interested in the news mentioned to us in a letter just received at this office from Mrs. George Johnson of Seaton, Ill. She writes that on April first she had over 600 fine growing chicks, some being hatched in February, from her pen that is headed by her first cock at the Illinois State Fair last September.

"The females in this pen are being trap-nested and an average of twenty-one eggs were laid by each per month from November first to April first. Mrs. Johnson reports a splendid sale of stock last winter and says her egg orders have been very large. Her ad on another page of this issue announces a one-half price on hatching eggs after the 15th of this month."

"James Smith, of Hudson, New York, writes us that his well known strain of heavy laying, exhibition White Wyandottes again held up their winning reputation at the great Boston Show last month. In competition with the best birds of the world his stock won 1st cock, 2nd cockerel, 3rd pullet and 1st pen. This is the fourth year Smith's White Wyandottes have won well at this show. He reports about 200 choice breeding and exhibition birds left for sale."

## CUTS AND ILLUSTRATIONS

Cuts and illustrations should play a very important part in building up your trade in Standard-bred poultry, but they must be good cuts, not patch-work or botched-up jobs, good pictures of the birds they are intended to represent. A poor cut or picture is worse than none. When you desire the best photo possible of your best bird, have your work done by a reputable artist who understands how to pose a bird so as to make it look as natural as possible. An unretouched photograph, provided it is a good one, should be as valuable as an advertisement as one which is "made over" by the artist until a strong imagination is required to see any resemblance between the finished product and the original. The sentiment against cuts made from over-retouched photographs is rapidly growing among honest poultrymen. Legitimate artist work and retouching so as to show the true shape and color of the bird is justifiable and profitable. Stock cuts, cuts made from idealized drawings, can be purchased from the leading poultry journals. These are much better than nothing, but not as good as first class photographs of your own individual birds. Poultry journals in which you are carrying display advertising the year around will be glad to run a reasonable number of cuts for you free of charge. You, of course, are to pay the original cost of the cuts themselves. You will also have use for your cuts in advertisements on your letter heads, in your circulars, mating lists, catalogs, etc. For such purposes copper halftones, made with a 120-line screen are usually the best.

## BUSINESS CARDS

It is very important that you have some well printed business cards. Your name and address, together with the breeds or varieties you breed, should be neatly printed on these cards. The cards should be about 2½ inches wide by 3½ to 4 inches long. You can use the back side of the card on which to print some fact regarding your birds. Avoid generalities. State plainly only facts regarding the egg production of your birds, leading shows at which they have proven winners, and the price of your hatching eggs or baby chicks might well be mentioned, also. These cards are useful to visitors who happen by your farm or yards, who, though never having heard of you previously, before leaving ask you for your card or address that they might write you later.

Such cards are very necessary whenever you visit or exhibit at Poultry Exhibitions. You will talk to many prospective customers who are, perhaps, not in a position to place their order for stock, eggs or chicks at that particular time, but would be interested later on. Such persons should be given one of your cards. A neat, well printed business card also adds prestige to your business. They cost very little. You can usually procure 500 cards at from $3.00 to $4.00, depending somewhat upon the size and the amount of reading matter to be printed upon them.

## WRITE ARTICLES FOR JOURNALS

You must get a lot of publicity and the people must become acquainted with your name before you can build up a very big business in the poultry world. A very good method of getting some publicity is to write articles for journals and papers in which you carry advertisements. The public will read your articles and they will soon feel that they know you. Your articles must contain good, practical information, or else they might do more harm than good. You can illustrate the articles with the photographs of your own birds, and your own houses and equipment. In the article you can refer to your own farm, your birds, and your own experiences. In this way you may get a lot of valuable publicity, and at the same time furnish the public with some information that is really worth while. Study the articles written by others. Note they do not try to "toot their own horn" so much as they strive to tell of "instructive experience," and in so doing they gain the confidence of the general public.

Everything of this kind helps you one step nearer to success.

## VISITING POULTRY EXHIBITIONS

One of the very best mediums through which to gain a broader acquaintance with poultry judges, editors and managers of poultry publications, and a large number of leading breeders and exhibitors, is the poultry show. Nearby local shows and fall fairs should be personally visited by you whenever possible. Some winter shows, at least one prominent winter show, even though located several miles from your home, should be visited each year. Do not make the mistake of thinking it necessary to buy the meals and cigars for everyone you meet at such exhibitions; but try to be "a hail fellow well met," pleasant, but at the same time serious and conscientious. Develop the respect of those you meet. Do not make yourself a bore. Never criticise the birds on exhibit. Never criticise the judges' placing of the awards. Have a good word for every one. Compliment the owners of the winners even though you are not one of them. And any breeder you meet will go home remembering you as "a mighty nice fellow." Gradually this word is passed from lip to lip, and even though you may be breeding White Wyandottes, it is surprising how a broad and friendly acquaintance will oftentimes be the indirect result of an order from some customer whom you have been recommended to by a breeder of Barred Rocks, White Leghorns, Black Langshans, or by breeders of other varieties.

## SHALL I EXHIBIT MY BIRDS?

We believe you should exhibit at one or more shows each season, or at least every other season. If you make a good winning at some good show then stay away from other exhibitions until you have thoroughly advertised the last good winnings for a year or two. After you have made a good winning do not give some other breeder a chance to defeat you and take your honors away from you at some other show until you have reaped the benefit derived from your good winning.

When you decide to make a show, see that your birds are in proper condition. Do not enter just two or three or four, but wait until you have a reasonably good string of good ones, then enter in all classes and enter from 10 to 40, depending upon the number and quality which you have. You need not wait until you have a "full string" of "all stars" before making your first "big or National" show. If you realize you have one crackerjack and that it will be in plumage condition, then do not hesitate, but enter it at one of the best shows in the land. Many breeders claimed their first step in this manner. Make fewer shows and try to make a winning worth while when you do show. If you know your variety and you enter enough birds, you are almost certain to make a hit somewhere.

It is quite expensive to exhibit birds and it is best to exhibit more birds and make better winnings at fewer shows. If you are a small breeder you will have to be content with fewer entries. We recommend showing at your local show and at one other show which has considerable reputation in the section where you desire to do business. It is often advisable to make State Fairs, but do not drag your birds around from show to show each season. It is very expensive and is also hard on your birds. Do not attempt more than two good shows in one season.

After you have made your winnings they will do you no good unless you advertise the fact.

## SOME BREEDERS DO NOT EXHIBIT

It is the custom of some of the breeders not to show their own stock. They make a specialty of producing high class birds and selling them to their customers, who win upon them. The percentage of such breeders is rather small. Usually these men spend great sums in advertising. Some of the largest advertisers are men who seldom show in hot competition. They contend that it pays them better to spend the money they would use in exhibiting their birds in judicious advertising. They use more space and put out strong advertising, and they get the business. As to whether it is best for you to adopt this plan, you can best decide this for yourself after you have given both plans a trial.

## THE GENERAL APPEARANCE OF YOUR EXHIBITION IS IMPORTANT

Never exhibit your birds at a fall fair or winter poultry show by placing too many of them in one exhibition coop. Birds entered in the single classes give a much better appearance if each single entry bird is caged in an individual coop. A few days before shipping your birds they should be carefully selected, placed in exhibition or training coops, and should be handled carefully and gently. Care must always be taken in handling exhibition birds, always removing them from the coop head first and placing them back in the same manner. Otherwise, there is danger of them flopping their wings and breaking one or more wing feathers, which lessons your chances of winning in strong competition. Your exhibition coops, or your shipping coops used for sending your birds to a large show, should always be well bedded with a good, clean, dry litter. A mixture of coarse saw-dust and shavings is very desirable, as such bedding absorbs the droppings and prevents them from staining the plumage of the birds. The plumage of light-colored and white varieties should always be carefully washed and groomed before the birds are shipped to the exhibit, and in every case the legs and feet should be gone over thoroughly until all particles of stain and dirst are removed. A little vinegar rubbed on the comb, wattles and ear-lobes of your birds will brighten up the color and they will present a more pleasing appearance. Never use any oily substance on the combs or wattles of show birds, for this is apt to cause their plumage to become soiled. The appearance of your exhibits in any show room goes a long way towards creating a good or bad impression on the breeders from whom you must expect to receive some of your future orders. Therefore, it is very important.

## BE A GOOD SHOW ROOM LOSER

Exhibiting your best fowls in one or more poultry exhibitions is generally regarded as highly essential, not so much on account of the immediate advertising you may derive in that exhibit, but on account of the fact that you create winnings, which is the "ammunition' you must have to put into your circulars, mating lists, catalogs, and ad copy to give your ad a strong "pulling power." The reader of any poultry journal prefers writing to men whose birds have been successful in the show room, when they are in need of stock or eggs. In showing your fowls do not make the mistake of being a poor loser. Every judge will make mistakes; and sometimes what may appear to be mistakes to you in reality are not mistakes. He doubtless has found some defective section on which you had not placed much importance, or the defect may have been overlooked by you entirely. The chances are you would never say anything if you win more than you anticipated after looking over "the other fellow's birds." Therefore, it would be decidedly unfair for you to "protest" or "roast" the judge for his awards if you failed to win what you anticipated. Remember the aim of the judge is to place the awards on the right birds; that is his stock in trade. He realizes that by doing this and pleasing the largest number of exhibitors and the unbaised visitors, who really know the defects in qualities of birds, he is building a reputation for himself, and thereby placing himself in a position to command larger prices for his judging and the opportunities for offering at better and larger shows. If you fail to win all that you think your birds deserve say nothing about it. Be a good loser. Make no comments on the fact that you did not win a certain prize. Devote all of your energies, when the occasion demands it, to making mention of what you did win. **What you did not win** will bring you no orders and will not help to build up a trade, whereas **what you did win** will help in that direction. Stronger still is the value of friends, and one of the easiest ways for a bereder to make enemies and lose friends is to be a knocker, or a poor loser. On the other hand, do not become "a bragger and blower." In case you win a fifth prize, or its equivalent, at a good show, do not endeavor to "burn up the town." Be reasonably modest, and, as stated above, in an agreeable manner make mention of the fact that you were among the winners, should the occasion present itself.

## ADVERTISING SHOW ROOM SALES

Wise is the poultryman who cultivates the acquaintance of the officials of a poultry exhibition; but he must bear in mind that those officials are usually busy. A live wire secretary, president or superintendent of the average show welcomes any "news item" which can be utilized by their association as material for the daily or weekly newspaper to be used in a write-up of the show. One recognized source of news is the sales of stock or hatching eggs which are made in the show room. Most show room officials are very proud of having their exhibition looked upon as a good "sales show." Therefore, in case you are fortunate in consummating any sales at the shows where you exhibit, make it a point to mention the fact, without necessarily giving full particulars, to one or more of the officials of the show. This will help the show, and if the information is used as a part of a write-up given by local newspapers, it is of great value to you as an advertisement.

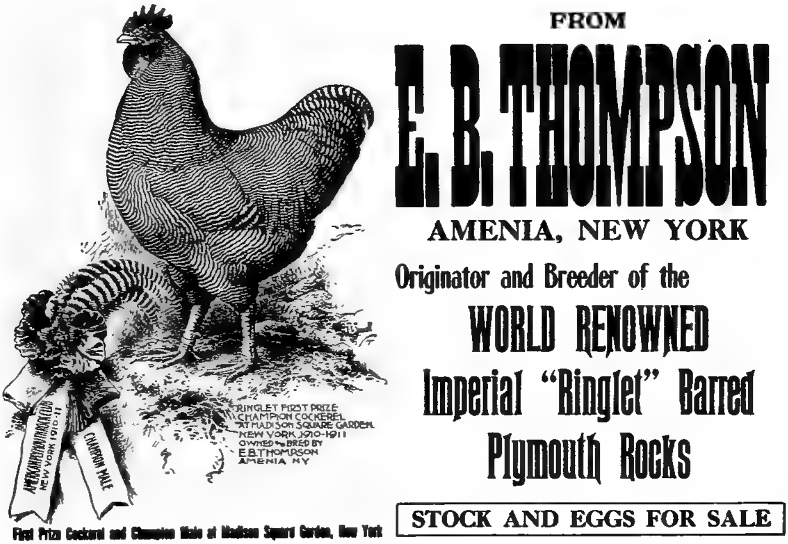
## DISPLAY OR "COOP" CARDS

Before making your first exhibition it is well to have some cards printed which are about 2 inches wide by 10 to 15 inches long. These cards should be neat and attractive. The printed matter should be in plain, bold, black-face type. The first or main line of the printed matter should simply give your last name, followed by the name of the variety you breed; as, for example, "Johnson's Buff Cochins." Below this main line, which should cover a greater portion of the length of the card, print a very short line in smaller type; this line should be in the center of the length of the card, and should read, "Bred, owned and raised by." Beneath this will be the third and last line to appear on the card; this line will merely give your complete name, the name of your yards or farm, and your address. It will be very well to place a special key-number in the address on these cards.

These cards are to be used by tacking or fastening them in the bars on the front of each of your exhibition coops. Many interested visitors pass down the aisles looking at the breeds and varieties with the desire of obtaining stock or eggs from the leading exhibitors. Very often the exhibitors are elsewhere in the show-hall. The visitor, perhaps, is in a hurry and cannot come back, and goes away without the information unless he gets the name from the card. When these cards are on your coops, the visitor can write your name and address on a piece of paper and carry it home with him, writing you later regarding the purchase of eggs or stock. Such cards are inexpensive and can be preserved and used at several different shows. They have proven a great help in assisting the work of building up a profitable trade in Standard-bred poultry.

## PREPARING BIRDS FOR SHIPMENT

Never ship a bird to a customer unless you have gone over it thoroughly, making a final examination, to be certain it has no disqualifications. If it is a clean legged variety, make a final inspection of legs and toes and the web between the toes, to be absolutely certain there is no down, stubs, or feathers. Use a good, stiff brush, warm water and soapsuds, and after soaking its feet and legs a few moments, wash them thoroughly, removing all dirt and stain on and beneath the scales. If you are a breeder of some white variety, it will pay you well, and give you much practice besides, to wash this bird and dry it thoroughly, the same as if you were preparing it for some exhibition. Place a neat leg band on its leg. The average purchaser is always pleased to note this. Ship the bird in a substantial but light weight shipping crate made especially for the crating of exhibition or breeding birds. Many different styles and types of shipping boxes are manufactured and offered for sale. These are advertised in the miscellaneous poultry journals. A label not smaller in size than 10x12, printed in two colors of red and black and illustrated with a photograph of some of your very best birds, should be pasted on each side of the shipping crate. Below is a sample of such a label. This reproduction is, of course, much reduced in size.


NEW YORK 1910-11
CHAMPION MALE
RINGLET FIRST PRIZE
CHAMPION COCKEREL
AT MADISON SQUARE GARDEN
NEW YORK 1910-1911
OWNED & BRED BY
E.B. THOMPSON
AMENIA NY

First Prize Cockerel and Champion Male at Madison Square Garden, New York

FROM

**E. B. THOMPSON**

**AMENIA, NEW YORK**

**Originator and Breeder of the**

**WORLD RENOWNED**

**Imperial "Ringlet" Barred**

**Plymouth Rocks**

**STOCK AND EGGS FOR SALE**

One of America's most noted breeders once stated that whenever he sold a bird for a price of $15.00 or more, it was shipped in a shipping box which cost him, knocked down, $1.50. He explained the pains he took in cleaning and washing the bird's feet and legs and plumage, how careful he was to band it, place an attractive label on each side of the box, and ended with the remark: "When it comes to pleasing the customer, it is 'the package at the depot' that counts."

## TURNING INQUIRIES INTO SALES

All any poultry paper can do is to bring you the inquiries. It is up to you to do the rest. Many an inexperienced advertiser has found serious fault with the journal in which he happened to be advertising because each inqury did not produce a sale. As a matter of fact, the journal was not in the least at fault. The best of salesmen cannot turn every inquiry into a sale and such a record should not be expected. The problem is how to turn the largest possible number of inquiries into sales.

There is a large number of factors which enter into the turning of inquiries into sales. Some of them seem relatively unimportant, yet they should not be overlooked. Let us consider each of them separately.

## USE NEAT STATIONERY

If you were to call in person on your prospective customer, he would instinctively form an opinion of you by your personal appearance. When you write him a letter he forms just as distinct an opinion as though you called in person, and that opinion is quite largely determined by the general appearance of your letter head and envelopes. Thus the advisability of having neat, business-like stationery becomes at once apparent. If you answer your inquiries on plain tablet paper and buy an envelope at the Post Office, the opinion which the recipient will form of you will not be flattering, to say the least. It is not necessary to have your letter heads embossed on the highest grade of bond paper in order to have them look business-like, but they should be neatly gotten up and well printed. The same is true of envelopes and other printed matter.

## GET A TYPEWRITER!

Thirty years in the poultry business in its various branches, in which correspondence has been carried on with thousands of poultrymen, impelled the writer to give the above advice. Some letters of breeders who really have good stock for sale are "fearfully and wonderfully made." The writing is terrible and the spelling is worse. Of course, the typewriter will not remedy the spelling, but the recipient of the letter will have a fairer chance to tell what the sender is trying to say.

The modern successful poultry breeder does business in a modern business way, and no business which requires correspondence can lay claim to being modern without the use of a typewriter. The very fact that you use a typewriter marks you as being progressive and up-to-date—just the sort of man with whom anyone likes to do business.

Furthermore, by the use of the typewriter, you can keep a carbon copy of all the letters you write, a very wise and important thing to do. It not only enables you to know **exactly** what you described to a prospective customer when he sent in his order, but it also effectually does away with any chance for a misunderstanding to arise. More than one law suit has been avoided by one party or the other having a carbon copy of his correspondence.

It is not necessary for you to buy an expensive machine to start with. Good serviceable second-hand machines can be bought from a third to half the standard price. You do not need to be a business college graduate in order to operate a typewriter. The art can be readily picked up during your spare minutes and in two or three weeks' time you will be writing like an "old timer." By all means get a typewriter.

## ENCLOSURES ARE VALUABLE

Every letter which you send out should contain some sort of a circular or booklet. Do not try to give the prospective customer all the information he ought to have regarding your stock in a personal letter. Life is too short, besides, it is both cheaper and more effective to give it to him in printed form. The personal letter should be devoted to answering in detail the questions asked in the letter of inquiry, rather than to a general description of your stock and plant, prizes won, etc. A very important feature of your inclosure should be testimonials, neatly printed on a sheet containing an illustration made from a photo of one or more of your best birds. Confidence begets confidence, and the more testimonials you can inclose with your letter, the more likely you are to get the order.

## ANSWERING THE INQUIRIES

When you receive a letter of inquiry, do not make the mistake of taking it for granted that you are the only one to whom the party has written. The chances are that you are one of half a dozen breeders to whom he has written. Whether or not you succeed in securing the order depends upon the general impression which he gets from your advertising matter, circulars, stationery, etc., PLUS your ability to convince him that you have exactly what he is looking for, and that the price you are charging for it is a fair one.

Before attempting to answer the letter, read it carefully, two or three times if necessary. Be sure that you thoroughly understand the letter. Otherwise, you cannot answer it in a general way and at the same time suggest to your prospective customer that he give you fuller details as to what he wants. If you can get him to write you a second letter, it shows that he is interested and that you stand a reasonably good chance of landing the order.

Suppose, for instance, that you receive an inquiry on a postal card, which reads as follows:

> Dear Sir:
>
> Please quote price on cockerels.
>
> Yours truly,
> John Jones.

An inquiry could not well be more vague or general than this one, yet you will receive many like it. The following answer to the above inquiry will serve to illustrate the general way in which it should be answered:

> Mr. John Jones,
> Anywhere in U. S. A.
>
> Dear Mr. Jones:
>
> I was glad to receive your postal card this morning asking for prices on cockerels. I am a little at a loss to know how to answer it, however, because you failed to state what age you wanted the cock-

erels, and what quality. If you will kindly give me a little more information along this line I shall be glad to describe in detail what I have that I think will suit you, and to quote prices.

As you will see by the enclosed circular, we have cockerels hatched from January to May, and ranging in price from $3.00 to $25.00, depending upon age, breeding and quality. Please do not think that our $3.00 cockerels are culls, for they are not. We sell our culls to Armour & Co. They are good growthy birds, free from disqualifications, and well worth the money for use on farm flocks.

I am very sure that I can please you in both quality and price, Mr. Jones, and I hope that I may hear from you by return mail with your order, and I will do my best to please you.

Again thanking you for your inquiry and awaiting your early reply, I am,
Cordially yours,

If instead of a general inquiry, like the one noted above, you should receive one which goes into detail, similar to the letter which follows, your problem will be different.

Dear sir:

I am on the market for a good cockerel to mate with six of my best S. C. White Leghorn hens. Each of these hens laid more than 200 eggs in her pullet year, and I am anxious to mate them with a cockerel from a high producing hen, who is himself a good individual, measured by the Standard. I am willing to pay a reasonable price for a cockerel meeting these requirements. What can you do for me?

Very truly yours, John Jones.

Such a letter as the one above is sufficiently explicit so that you can answer it intelligently. In a nut-shell, John Jones wants a S. C. White Legorn cockerel that has been bred both for egg production and Standard points. And he must not only have been bred right, but he must be right himself. The first thing for you to do is to **assure yourself** that you have a cockerel which meets the requirements laid down by Mr. Jones. The next thing to do is to convince Mr. Jones that you have him and that he is worth the price you ask. If you should find that you haven't a cockerel which meets the requirements, say so frankly. "Honesty is the best policy"—even in the poultry business. Assuming, however, that you have one, your answer will be somewhat as follows:

Mr. John Jones,
Anywhere in U. S. A.

Dear Mr. Jones:

With your letter and my record book in hand, I have carefully gone over my flock of cockerels. I find that I have one bird left that seems to exactly fulfill your requirements. He is cockerel No. 2601, hatched March 18th, out of hen No. 26. This hen laid 218 eggs in her pullet year.

This cockerel is a well developed, husky fellow, proud as a peacock. He has a broad deep body, with legs set well apart, showing every indication of strong breeding power. He has a medium sized, well formed five point comb, red eyes, and rich yellow beak and legs. His tail is well spread. His worst fault is that he carries his tail a trifle high, but he has so many other redeeming features that he could win in hot competition. His plumage is white throughout, with the exception of a slight tinge of creaminess on the quills of the primary wing feathers.

I am asking $25.00 for this fellow, and I think enough of him that I will take him back without a murmur, if you do not feel that he is worth the money, and then some, after you have had him two or three days.

Enclosed herewith you will find a circular which tells all about our "Model" Strain of S. C. White Leghorns, together with what our customers think of them. Please read it carefully, noting our terms and guarantees.

I hope you will see your way to order this cockerel, Mr. Jones, because, as I have said before, I feel sure that he is just what you are looking for.

Thanking you for your inquiry, and awaiting your favorable reply,
I remain,
Cordially yours,

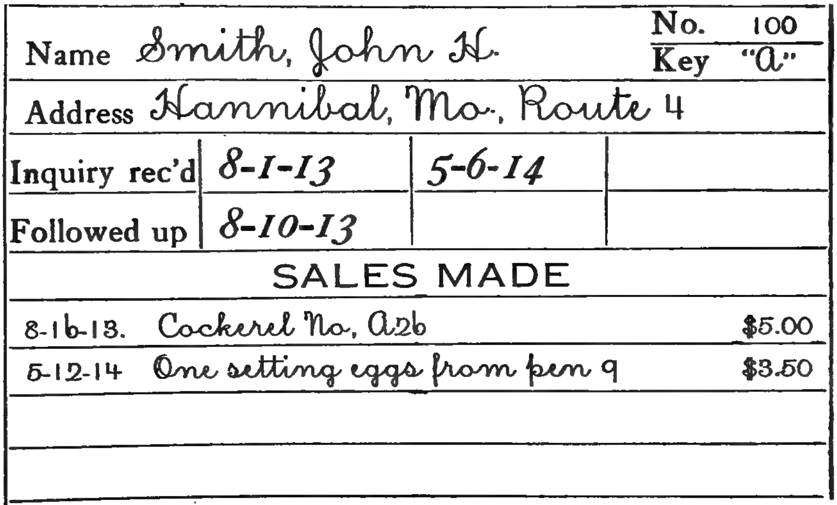
In answering inquiries for stock, an attempt should be made to find the bird or birds which seem to best fulfill the requirements, and then to visualize them; draw a word picture of them so that the prospective customer may form a fairly definite idea of what you are offering him. Do not overdraw the picture. Try to view the bird with as critical an eye as your prospective customer will have. It is hard sometimes to point out a defect in a bird you are trying to sell, but it is the safest way of insuring satisfied customers.

## ANSWERING ALL MAIL PROMPTLY

Do not take for granted, when you receive an inquiry regarding stock, eggs, or chicks, that you are the only breeder to whom the prospective customer has written. The chances are he has written to several different breeders. If you delay in answering your mail the other breeders, who have answered promptly, are sure to get the order, while you lose out. In addition, promptness creates confidence in you. We like to feel that all mail we write pertaining to business is of very great importance and it is very pleasing to receive an answer immediately. We think more of the man or the concern that answers our letters in that manner. In the Standard-Bred Poultry Business a great many prospective buyers "Get the fever one day, while the very next week their fever is decidedly below normal."

During on of these "spells" they are somewhat excited or enthusiastic and they write you about a good exhibition and breeding bird, or a sitting of your very best eggs. If you delay in answering they may have lost their keenness for making the purchase by the

A SAMPLE RECORD CARD



Name Smith, John H.
No. 100
Key "A"
Address Hannibal, Mo., Route 4

| | | | |
|---|---|---|---|
| Inquiry rec'd | 8-1-13 | 5-6-14 | |
| Followed up | 8-10-13 | | |

SALES MADE

| | | |
|---|---|---|
| 8-16-13. | Cockerel No. A26 | $5.00 |
| 5-12-14 | One setting eggs from pen 9 | $3.50 |

time they receive your letter. It is a very safe plan to follow the old rule of "Striking while the iron is hot."

It is not essential to your success that you have an office with a mahogany desk and a plush rug on the floor. But you should have an office, even if it is no more than a corner in the dining room. It should be equipped with a desk in which to keep your papers and records. There should also be a vertical letter file and a card index. The latter two are especially important.

A vertical letter file is equipped with manila folders large enough so that an ordinary letter can be put into it flat. These folders stand in the file vertically, hence the name, "Vertical Letter File." A separate folder is used for each person with whom you have any correspondence. These folders are numbered consecutively from one up, and the name and address of the person whose correspondence is in each file is written along the upper edge.

Used in conjunction with the letter file is a card index, for the keeping of records, and to facilitate the use of the letter file. A sample of a suitable card is shown herewith. The method of procedure is as follows:

When you receive your first inquiry, you, of course, first answer the letter, pinning the carbon copy of your reply to the inquiry, when it is ready for filing. You then take an index card, printed or ruled as above, and fill it out. As the cards are to be filed alphabetically, it is best, in filling in the name, to put the person's last name first. Then follows the complete address and the date when the inquiry was received and answered. The number in the upper right hand corner is the number of the folder in which you place the correspondence. The first one which we are now filling out will, of course, be No. 1. Just below the number you place the "key," by which you know which paper should be credited with the inquiry.

After you have received a good many inquiries and have your file started, the procedure is slightly different. Upon receiving an inquiry, it is a good plan to first look in your card index to see if you have ever had any previous correspondence with him. Suppose, for instance, you receive an inquiry from John H. Smith, Hannibal, Mo. You look in your card index and you find the card illustrated above. It immediately gives you a lot of valuable information. You learn that he is an old customer of yours, and that you will find all the correspondence which you have ever had with him in folder No. 100 in your letter file. You learn further, that you sold him a cockerel for $5.00 on August 16, 1913, and a setting of eggs for $3 on May 12, 1914. You see, also, that you had to write him twice before you sold him the cockerel, which brings us to another very important point—the follow-up.

## THE FOLLOW-UP

No modern business house doing a mail order business would think of doing business without a careful "follow-up" system. If the order does not come in reply to the first letter, within a reasonable length of time, a second letter is sent, and sometimes a third, if the second does not suffice. Results prove conclusively, that a "follow-up" system pays in the poultry business, at least to the extent of one follow-up letter. Oftentimes a new argument will be presented or a new fact pointed out, or the very fact that you are progressive enough to write a second letter will land the order where the first letter would have failed. The length of time which should elapse between the first and second letters depends upon how far away the inquirer lives. If a reply to the first letter fails to come after time enough has been given for it to do so, if answered promptly, the follow-up letter should be sent. From a week to ten days is usually long enough to wait.

## A MAILING LIST IMPORTANT

At different times of the year you may find yourself handicapped from want of house and yard room, and, therefore, desirous of quickly selling a large number of your birds. At the end of the breeding season, you may desire to dispose of several of your Cocks and Hens, or at the end of the hatching egg season you may desire to make a special offer to dispose of many settings of eggs at about one-half your regular price.

To do these things experienced breeders usually resort to getting up a neat, well printed circular or folder describing what they have for sale and the reasons for a special sale and price. To sit back at this time and depend altogether upon the inquiries received from day to day from the advertising then being run by you, would be rather a slow method of working up any volume to your special sale. If you can gradually build up a mailing list of parties who have bought from you in the past or inquired of you for your terms and prices, of parties whom you have met, or visitors who have come to your place from other sources, it will be of untold value to use on such occasions.

One very good method often employed in order to secure the names and addresses of those actually interested in your birds is to buy a memorandum book at some book or news-stand, fasten this to your exhibition cages with a tack, cord or string. You can either place a neat card sign on your coop, or, with pen and ink, you can write a sign in large bold letters on the cover of the note-book, inviting anyone who is interested in your birds and would like to receive your catalog or mating circular next spring to please write their name and address in the book. It is well to have a pencil attached to the book with a short stout cord.

If you were to get out a rather expensive catalog, I would not advise that you mail it promiscuously to that portion of your mailing list obtained in this latter manner, but you could well afford to mail circulars or folders which would not be expensive and would require, as a rule, not over a 1c postage stamp to mail them.

## TURNING INQUIRIES INTO CASH

The experience of men who are successful in business and who have had years of experience should be worth a great deal to our students, and for that reason we quote from Mr. R. H. Whitten of Los Angeles, Calif.:

"Too many persons—yes, intelligent persons, too, feel that advertising itself will prove the panacea for all their selling troubles. They think that if they succeed in writing advertisements that pull, they will merely need to sit back and watch the business roll in. They think that every inquiry is as good as an order—that the answering of the inquiry and getting the actual order back are matters of routine.

"But what a mistake! An advertisement is an opener for business, but not a closer. An inquiry gives you an opportunity, not an order. And your success depends, not upon the number of inquiries you receive, but upon the way you handle them. A dozen inquiries properly handled will result in more business than a hundred that are given only slight attention.

"When you place an advertisement in a magazine you enter in competition with other advertisers. Similarly, you must compete with others when you answer an inquiry, for it is safe to figure that each person who writes to you also writes to at least a half dozen other breeders.

"I believe that the most important thing to be remembered is that general statements never bring home the bacon. They make the answering of inquiries very easy, but mighty expensive, for unless you write such a direct, personal, specific letter, that after reading it, your prospect decided that he simply must have your stock in preference to all other stock that is offered—why, you can make up your mind that your time and postage have been wasted, for the order will surely go to someone who may not have any better stock, but who knows enough to write a letter that is as appetizing as the pies mother used to make.

"When you receive an inquiry, study it carefully in order to get a clear conception of the writer's circumferences and needs. I always notice the handwriting and the stationery; whether a post card or a letter; whether written with ink or pencil. Not that I place any less value on a postal inquiry, or one written with a pencil, for some of my best orders have been secured from such inquiries. But it helps me to know the prospect better, and this helps me in composing my letter. I go through the prospect's inquiry very carefully, often reading more between the lines than in what is actually written. A powerful imagination must be brought into play, for not one person in a dozen states his requirements clearly, and you must be able to size up the situation from the material at hand and determine what is wanted—or rather, what is needed. For very often what is really needed is quite different from what is asked for.

"In writing sales-bringing letters, as in advertising, every word which does not add selling force positively weakens the text, so you should omit those old hackneyed introductions with which you are familiar. I know how easy it is to begin with "Answering your valued favor," or "I beg to acknowledge receipt," or "I have your inquiry," but what is your chief object—to follow the line of least resistance and get through with your letter writing as easily as possible, or to put snap, conviction and selling power into what you write?

"A good beginning is half the winning, and the quicker you grip a reader's attention after starting your letter the better your chance will be to sell him.

"Avoid all time-worn expressions and weather-beaten phrases. No formal opening is necessary. Your prospect is anxious to see vigorous chicks coming, and cares nothing about being reminded of the date of his letter; he knows that you received it or you would not be answering it. So, omit all the customary expressions used in beginning letters and get right down to the things that will interest him most.

"But remember, all generalties must be omitted. Pick out what you think he wants and describe it carefully and clearly. Picture it so vividly that he will see it right before him—complete in every detail.

"The salesman learns that the most important and deciding part of his plea is his final argument—the so-called "closing talk." Yet few business letter writers even know that there is such an element in a good letter as an effective climax. They break their letters off at the end of any commonplace sentence, without the least attempt at forceful finale. And then they wind up with some moss-covered and meaningless phrase like, 'trusting to hear from you further,' or 'Thanking you for past favors.' They leave their prospects high and dry on the rocks, where they stay until a letter from a skillful competitor comes along and bags the order.

"In quoting your price you must add a few words to show your prospect that it is the right price—not that he is going to get fifty dollars' worth for ten dollars, but that he will receive full, honest value for his money. And back up your qoutation with a guarantee of satisfaction to remove all doubt and hesitancy.

"And now for a few general suggestions:

"A printed letter head gives prestige and will quickly pay for itself, but do not use a cheap letter head unless you want to give the impression that you have cheap stock. People size your stock up by your letter, and the quality of the paper and printing play quite as important a part in creating a favorable impression as do your writing and the wording of the letter.

"If you can afford it, get a typewriter, but remember that a well written long-hand letter is preferable to a poorly typewritten letter.

"Be sure to spell the person's name correctly. If you do not you will antagonize him at the start, and he will not be in the proper frame of mind to read your letter.

"Use common words, and have your sentences and paragraphs short. Make your letters easy to read, a plain heart-to-heart talk, using the same language that you would in a personal interview.

"Reply to all inquiries promptly, and be sure to answer all questions fully. If you do not, the other fellow will, and he will get the order."

## STUDY METHODS OF MARKETING AND SALESMANSHIP

Many good poultrymen who raise some of the finest stock of their variety that is bred, ruin their chances of success by writing letters with a pencil on an old brown piece of pencil tablet paper. This is enclosed in a small envelope about half big enough for it, and nothing is printed on the envelope. As soon as such a letter is received by a prospective buyer, he decides right then and there that this is a careless breeder and that he cannot afford to trust his order to such a person. Instead, he will send his order to some breeder who wrote a nice letter, on neatly printed stationery, and perhaps this last mentioned breeder did not have half as good stock as the first one. The only way a buyer has to judge of the quality and value of what you offer is from the information which he can gather from your letter and the circulars or mating list enclosed therein. It does not have to be elaborate or expensive, but it should be neat and should be printed.

## A LETTER WITH EACH SHIPMENT

Many breeders make the mistake of shipping a setting of eggs withiout notifying the customer by letter the day they are shipped. As a result the eggs may remain in the express office for several days and a poor hatch and a dissatisfied customer are the result. Also, when you ship a bird be sure to have a letter mailed to your customer on the day the shipment is made, requesting the customer to be on the lookout for the shipment. This practice pays.

These letters should also contain other statements about the quality of the stock and eggs, and should close with the desire that your customer will be pleased with them and reassure him that it is your desire to please him and give him value received for his money. If you simply make the sale and then drop your customer he may feel like you were simply after his money and perhaps he has not gotten a square deal. A final letter from you, sent along with the shipment, notifies the party to be on the lookout for the shipment and at the same times reassures him that you have a desire to do what is right. Always try to deal honestly, and remember, a satisfied customer is your best advertisement.

## BUSINESS POLICY IN ADVERTISING AND SELLING POULTRY PRODUCTS

I urged John S. Martin of Port Dover, Ont., Canada, who has been unusually successful in building up a great and profitable business to tell me the inside secrets of his business policies. This is what he said:

"Advertising in general is one of the greatest forces in the world today. The truth of this was never so apparent as in the late war. Canada, with a population of nine million people, raised an army of 500,000 men and over 400,000 of them came by voluntary enlistment, in other words, by advertising. In Great Britain, the late Lord Kitchener called to his assistance the cleverest advertising experts in the country and by up-to-date methods raised a huge volunteer army of several million men. In fact, it is common knowledge that recruits came in more rapidly than it was possible to clothe and equip them. In the United States the great advertising campaign put on by Herbert Hoover for increased production and conservation of food is still fresh in our memory.

"Poultry advertising is no different from any other kind of advertising. The same rules apply. If improperly done, it is wasted effort to say nothing of the loss of money. At the present time, with paper and printing costs so high, advertising is expensive and it is especially important for us to advertise judiciously. I am firmly of the opinion that the beginner should be very conservative and increase his advertising as his plant develops.

"We must not lose sight of the fact that advertising is a study and we must devote intelligent thought to it or we will not make much progress. Each year vast fortunes are made by successful advertising while, on the other hand, vast fortunes are lost by advertising improperly done.

Advertising is simply placing your business before the public and it should be dignified in its appeal. A bragging advertisement defeats its own purpose as it simply digusts the reader.

"The following points should be kept in mind in making up your advertisement:

"1. All advertising should be clear and should convey to the reader exactly what you wish to tell him. Do not assume that he knows all about your birds. Tell him about them and show him that it will be to his interest to have some of them.

"2. Advertising should be regular, not spasmodic. A man may read your advertisement for years without buying anything. Then all at once he makes up his mind to purchase. The fact that your name and your birds have been regularly before him all the time, decides him to purchase from you.

"3. Advertising should be brief. Do not try to crowd all the reading matter into the space at your disposal. Use good-sized type and don't say too much.

"4. Make your advertising attractive. The object of the advertisement is to catch the eye of the reader as he casually turns over the pages of the journal. This can be accomplished by always using an attractive cut in the advertisement and by using good-sized type with a proper display.

"5. The advertisement should be truthful. Tell the truth. Make no claims that cannot be substantiated. If you publish winnings, tell exactly when and where they were made. Do not say, 'Winners wherever shown.' It means nothing and is deceptive.

"In years gone by I can recall a number of breeders whose advertising might be called misleading if not untruthful and none of them ever got very far in the poultry business. In old English common law there was a doctrine called 'Caveat emptor'—'Let the buyer beware.' If the purchaser found hidden defects in the article he had purchased, he had no redress and had to be satisfied with his bargain.

"Today modern business methods are such that this is wholly a dead letter. The modern idea is 'the customer is always right.' As a matter of fact, the customer is not always right, but modern business ethics are such that it is believed advantageous to go the limit in order to please a customer. These principles should be followed in the poultry business. Some customers are very unreasonable but, as a rule, they are few in number and it will pay to satisfy them.

## ADVERTISER MUST DO HIS PART

"Some breeders have an iea that after they have given a contract for space and have sent in their copy, the poultry journal will do the rest. This is far from being the case. It is up to the poultry journal to bring you the inquiry and it is up to you to make the sale.

"Here is where many fall down—in handling the inquiry. Do not wait a week before answering it. Write a personal letter by return mail if possible. As it will be quite impossible to give your prospective customer complete information about your birds in a letter, it is obviously necessary to have a catalogue of some kind. Some send a catalogue but no letter, which is a mistake. The letter serves as an introduction and helps to establish confidence which is quite necessary before a sale can be made. If you get no response to your letter inside of ten days, write again. Perhaps the letter or catalogue went astray and if this is the case, you will nearly always get a reply. Some follow up an an inquiry several times, but I have never sent more than one follow-up letter.

"If you advertise in more than one journal, the advertisement should be keyed in some way so that you can tell which paper brings the most inquiries. I advertise in about sixteen poultry journals and I can look up my books and find out how many inquiries were received from the 'Reliable' the past year, or during any month of that year.

"While inquiries are a fairly good indication of the value of any medium, yet it is by no means conclusive. Some breeders go no further than the inquiry, but this is not enough. You must find out definitely how many of these resulted in orders. By tracing back each order to the original inquiry you can tell which journal should be given the credit and at the end of the year these orders can be added up and the total amount of business received from each journal can be arrived at.

"Thus you will have three columns of figures. In the first you have the number of inquiries from each paper, in the second the amount of business and in the third the amount of money spent in that paper.

"It is all very simple but very necessary to be able to correctly analyze your business in order to find out where you advertised at a profit and where you advertised at a loss.

"A full year's business should be the basis for your advertising appropriation of the following year. I have found that you can safely devote fifteen per cent of your gross income to advertising. This will include not only advertising in the journals, but also your catalogues. There was a time when I thought it quite proper to use the same amount of space in all journals, but I found this did not work out satisfactorily. Some journals will make big space pay while others will be found profitable where only small space is used.

## TO AVOID ANNUAL DULL PERIOD

"In the past ten or fifteen years the poultry business has changed in another respect. There used to be a long dull period, beginning in May and extending for several months. In recent years by having a Summer Sale both in stock and eggs, I have been able to do a good business right through the former dull season and I can truthfully say that now I haven't a dull month in the year.

"It is important to send out your catalogues and sale lists at the proper time and my experience has been that March 1st for catalogues and May 1st for sale lists are about right. Those on your mailing list who live in the South should get their catalogues not later than February 1st. If possible, have them printed early so as to be in a position to send them out to inquirers after the first of January.

"We now come to a most important matter, namely, the filling of the order. I am firmly of the opinion that a great many fail in the poultry business because they are too careless in filling orders and others because they have not a proper sense of values. It is most important to be able to estimate quickly and accurately the relative values of different birds.

"In shipping out birds use clean coops and send them in good condition. If they are white birds and dirty, wash them. It means more work but it will pay. First impressions are usually lasting and if the birds arrive in the pink of condition the customer is pleased with his purchase.

"I sell, on an average, 5,000 White Wyandottes a year and I can safely say that between 3,000 and 4,000 of them are washed before being shipped. In these days of rapid transit it does not take a customer long to return the birds if he is not pleased and, if they reach him in poor condition, he is not likely to be pleased.

"I had a friend take a position at a good salary with a firm manufacturing gas engines. The gas engines were not rated any too high and I said to him: 'Do you mean to tell me that they pay you $10,000 a year to sell—Gas Engines?' he said, 'No, they pay me that to make the d— things stay sold.'

"Each order properly handled should lead to further orders. The small order should receive your personal attention the same as the large one. I remember one customer whose first purchase was two cockerels at $5.00 each. These bords, being satisfactory, he kept coming back and inside of five years he was paying as high as $100.000 each for individual birds. Keep in close touch with your customers, because their success and your success are identical.

"See that your guarantee is as broad and as fair as you can possibly make it. Remember it is a mail order business and the customer does not see what he is buying until the birds arrive. His judgment may differ from yours and if he is not satisfied he should certainly be allowed to return the birds and have his money refunded. Do not sidestep, but meet your customer fairly and it will certainly pay."

## USE PROPER SHIPPING COOPS

If you are breeding good poultry and expect to get a good price for it, do not attempt to ship birds which you sell in soap boxes, cracker boxes and other boxes which are about half high enough or half big enough. The birds ought to have room to stand up in the coop or box. It should be wide enough and long enough so the plumage of the bird will not become broken and ruined in shipping. If the box is so low that the bird has to sit down most of the time, the plumage on the breast will become solied before the bird reaches its destination. If you want the customer to be pleased with the bird when it reaches him be sure to ship it in a coop large enough so that the bird will show off to the best possible advantage when it reaches the customer. Be sure to see that there is straw or clean litter in the bottom coop. Also, tack a watering cup or can to the inside.

Neither should you use a heavy dry-goods box and compel your customer to pay two or three times the express he should pay. We recently received a shipment of seven S. C. White Leghorn pullets. The birds only weighed twenty pounds and the box in which they were shipped weighed 250 pounds. We were compelled to pay several times as much express as we should and it is needless to say that we were dissatisfied with the shipment.

The coops for single birds can be made of lath. We use four 1x2 inch corner pieces and put in a solid bottom and then nail lath across the top. Around the sides we nail lath and over these we tack cheap muslin. This protects the birds and has a tendency to make them more quiet. These coops are built 18 inches wide, 24 inches long, and 24 to 30 inches high for single birds. They should be built larger for pairs, trios and pens.

Use boxes that are light, yet substantial, and see that they are large enough to carry the birds to their destination in the very best possible condition.

## BOOK ORDERS AHEAD

Especially in the Baby Chick and Hatching egg business, it is well to have an announcement in your circular or catalogue, stating that upon receipt of one-fifth or one-fourth of the purchase price, orders will be booked for delivery at any particular time. Balance of payment to be made on or before date of delivery. This plan often permits you to book your orders at the time the prospective customer is really interested. Should you wait until the customer is in actual need of the product something may have come up to have interested him in some other breeder or have caused him to give up the thought of making the purchase that season; further, it enables you to plan your own hatching to a much better advantage.

## HAVE YOUR NEIGHBORS RAISE STOCK AND PRODUCE EGGS

If you are going to depend upon the poultry business for a living, it is necessary that you be in a position to do a large volume of business to make it worth while. A flock which produces only a few settings of eggs or a man who raises only a few chickens will have to depend upon somthing else besides his poultry for support, in part at least.

A man may not have the room or, perhaps, not the time, and in either case it is a most excellent idea to put a pen or two of your birds, properly mated as you would mate them yourself, or place some of your eggs or baby chicks in the hands of your neighbors and friends. They can raise them at a less cost than you could by attempting to raise such a large number.

Some of the largest and most successful breeders of pure-bred poultry have a large per cent of their flock grown on the neighboring farms. They have an agreement with these people that they will pay them 50c to $1.00 per sitting for eggs, and 75c to $1.50 for all birds purchased from them by the breeder. Another popular form is to pay the raiser five cents per pound above market price for all stock taken back. This sometimes prompts the raiser to feed better and more wholesome food to the growing stock. The breeder looks after their matings and the birds are raised according to his directions.

The above practice is a good one. If you cannot produce enough stock and eggs on your own farm, or in your own yards, by all means get your neighbors to raise stock for you. The biggest and most successful poultry farms in this country do this and many of them would never have succeeded had they not done so. Even if you have a large farm it often pays to do this.

You are obliged to produce enough poultry so you will have enough to allow you to cull quite freely and still have a large number of choice specimens that will help you out when you go to select your string of show birds. It will give you more stock to draw from and enable you to do a larger volume of business, and, as a result, you will net more profit. It will not be necessary for you to have so much invested as you would if you raised the birds all on your own farm, neither will your risk be so great. If for any reason there is heavy mortality among the young stock, it will be the other fellow's feed, time and labor that is lost. From any point of view this practice is a good one.

## SELLING EGGS FOR HATCHING

More money undoubtedly changes hands in the annual sale of eggs for hatching than in any other branch of the pure-bred poultry business. Yet many, perhaps a majority, of the poultry breeders agree that it is the most unsatisfactory branch of the business. This condition is due to a number of reasons, many of them reasons over which neither buyer nor seller have any control. When a person buys a setting of eggs, theoretically at least, he considers that he is buying a chick in each egg. We all know that he rarely secures a chick from every egg. Again, he expects the chicks which he hatches to develop into birds equal, if not somewhat superior, to the parent stock. This they often fail to do, for reasons entirely beyond the control of the breeder who sold the eggs. Yet he generally gets the blame.

A fertile egg is one of nature's most fragile and delicate parcels. If it is to develop into a strong, healty, vigorous chick, it must be handled with care and kept in a favorable environment from the day it is laid until the day it is hatched. It must not be unduly jarred. It must not be placed where the temperature is warm enough to start the process of incubation; neither must it be chilled. Yet one or all of these things often happen to eggs for hatching while they are in transit from buyer to seller. Poor results follow, and, with the poor results, a dissatisfied customer. Again, the buyer may secure a satisfactory hatch, but, either on account of ignorance or carelessness, he does not feed, house and care for the chicks properly. Some of them die, the balance fail to feather out and mature properly, and the breeder from whom the eggs were purchased gets the blame. It is for reasons such as these just mentioned that some breeders have become so disgusted with the eggs-for-hatching business as to give it up entirely, confining their operations exclusively to the sale of stock, or of stock and baby chicks.

In view of these conditions, the question naturally arises as to whether it is possible, and, if possible, practicable, to so safeguard eggs for hatching in transit, and so guarantee them as to insure satisfaction to every fair-minded customer, and at the same time make the business a profitable one for the breeder. A good many years of experiences and observations has led the writer to answer the question in the affirmative.

## TEST YOUR BREEDERS

In the first place, the breeder should know that the eggs which he is sending out are running strongly fertile. Eggs should never be shipped from a breeding pen which has not been tested by placing the eggs in an incubator or under a hen. Furthermore, this testing should be continued almost constantly throughout the entire hatching season. Fertility in a breeding pen rarely runs uniform throughout the entire season. Usually it increases as the season progresses, but sometimes the tendency is just the opposite. Occasionally the male bird gets out of condition and fertility ceases entirely.

The practice of trap-nesting is of very great assistance to the breeder in keeping up a high percentage of fertility in the eggs which he sells for hatching purposes. The trap-nest often reveals the fact that certain hens in the pen are producing infertile eggs, or weakly fertile eggs in which the chicks die before hatching. Sometimes the taking out of two or three hens from the pen will nearly do away with the trouble of infertility. "Fore-warned is fore-armed," and the breeder who is progressive enough to trap-nest and test his breeding pens during the hatching season, and honest enough to return the money or replace the eggs when he knows that the fertility is not what it should be, will find that half the battle is won.

We strongly advise each student to practice the teachings set forth in lessons numbers 10 and 11, regarding the selecting and culling of breeders by testing them for "Prepotency." By following the teaching of these lessons you will insure stronger and more fertile eggs, and stronger and faster growing chicks, which are worth while to you and always pleasing to your customers.

## GUARANTEEING EGGS FOR HATCHING

Knowing that his eggs are running strongly fertile, and knowing how to pack and ship the eggs so that, barring accidents, they will reach the buyer in a hatchable condition, the breeder's next problem is to convince the prospective buyer that he can "deliver the goods." In order to do this, it is the almost universal custom to offer some sort of a guarantee as to the percentage of fertility or the number of chicks to be hatched per setting.

One of the most common guarantees is to the effect that if, **for any reason**, the buyers fails to secure a **satisfactory** hatch, the seller will replace the order at half the original price. The fact that this is the most common form of guarantee is a pretty good indication that it is the most popular. It appeals to the buyer as a fair proposition, because it has no "strings" to it, and because he is allowed to use his own judgment as to whether or not the hatch is satisfactory. He naturally assumes that the breeder would not make the offer if he did not have confidence in the hatchability of the original order.

This guarantee is undoubtedly abused by a certain class of buyers who take advantage of it to secure an additional number of eggs at a reduced price, even though the original order produced what any fair-minded man would consider a satisfactory hatch. Yet the seller has the satisfaction of knowing that every customer is a satisfied customer, which is one of the most important requirements in building up a permanent and profitable trade. At the same time he loses nothing, perhaps makes a little on the repeat order, unless, perchance, the demand for his eggs is so strong that he could dispose of all of them at original-order prices. In general, it may be said that the practice of refilling orders at half price, where the hatch is not satisfactory, is best adapted to the sale of cheap and medium priced eggs,

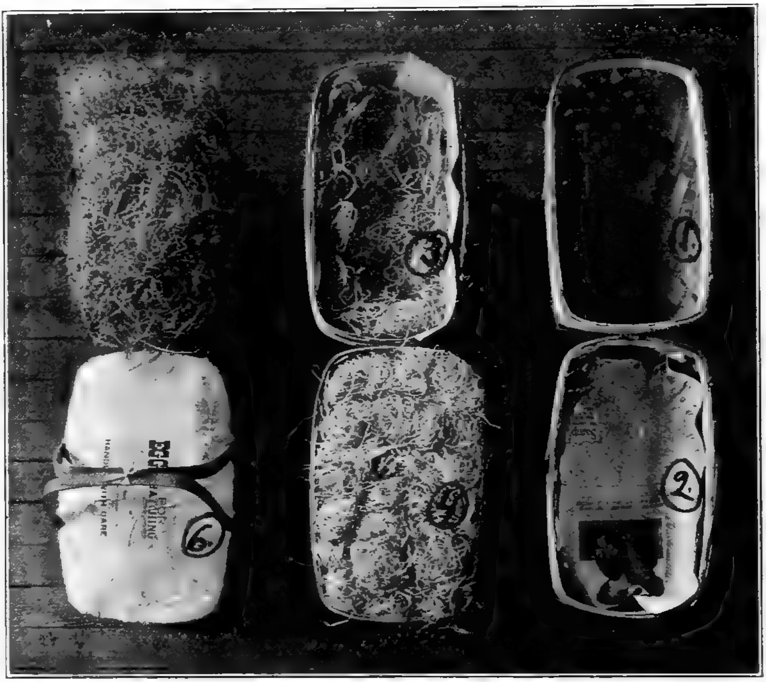
Correct method of placing cover on the basket of eggs after being packed for shipping.

by the breeder who has his reputation yet to make in the poultry world.

Perhaps the most common form of guaranteeing eggs for hatching on the part of breeders of National repute, is to replace, free of charge, all infertile eggs. This form of guarantee is especially used in the sale of high priced eggs, where the buyer feels that in consideration of the price paid for each egg that egg should be fertile, so that he will stand at least a reasonable chance of securing a live chick from each egg purchased.

Where infertile eggs are replaced free, the first point to be looked after is that of marking your eggs so that you will be sure that you are not replacing the other fellow's infertile eggs free. The best way of marking the eggs is by means of a circular rubber stamp which fits down over the large end of the egg, printing your name and address, and the name of your variety. These rubber stamps can be secured from most any stamp works.

In connection with the guarantee to replace infertile eggs free, it is usually stipulated that the eggs shall be tested out not later than the tenth day and returned, charges prepaid. There is not so much danger of breakage as there would be if the eggs were incubated for three weeks and then returned. Also, the buyer has the replaced eggs on hand ready for incubation by the time the first hatch is off. It is only customary to replace the eggs once, regardless of the results from the replaced eggs. .



See explanation on top of page 55

There are times, however, when the custom and guarantee must be cast aside and extra efforts made to insure your customer has really secured something tangible for his money. In cases of breakage by the express company, or poor hatches, even though due to some fault or neglect of the customer, it will always pay to be liberal and send a few more eggs. Customers will appreciate your fairness and liberality, will speak well of you, will be encouraged to remain in the business, and in most instances you will sell him more eggs and stock as the years go by.

A few well known poultry breeders do not guarantee their eggs for hatching in any way. They take the position that after they have seen to it that their eggs are running strongly fertile, and that they are properly packed and shipped, their responsibility ceases, and that from that time on, it is "up to" the buyer—that if the eggs are injured in transit, the exress company should pay the damages; and that if they are not properly incubated, it is not the fault of the seller. The number of breeders who follow this plan is still so small that the wisdom of it is yet an open question. For the beginner, who has his reputation still to make, and his trade yet to build up, the no-guarantee plan could hardly be considered advisable.

We believe you should make some sort of a guarantee and try to please every customer, even though they abuse the right. Do your utmost to give every customer a square deal.

## PACKING EGGS FOR HATCHING

## CORRECT METHOD OF PACKING HATCHING EGGS

No. 1. Shows the empty basket with handles down and out of the way for packing. No. 2. Shows the bottom and sides of the basket lined with ordinary newspaper. No. 3. Shows the next process,

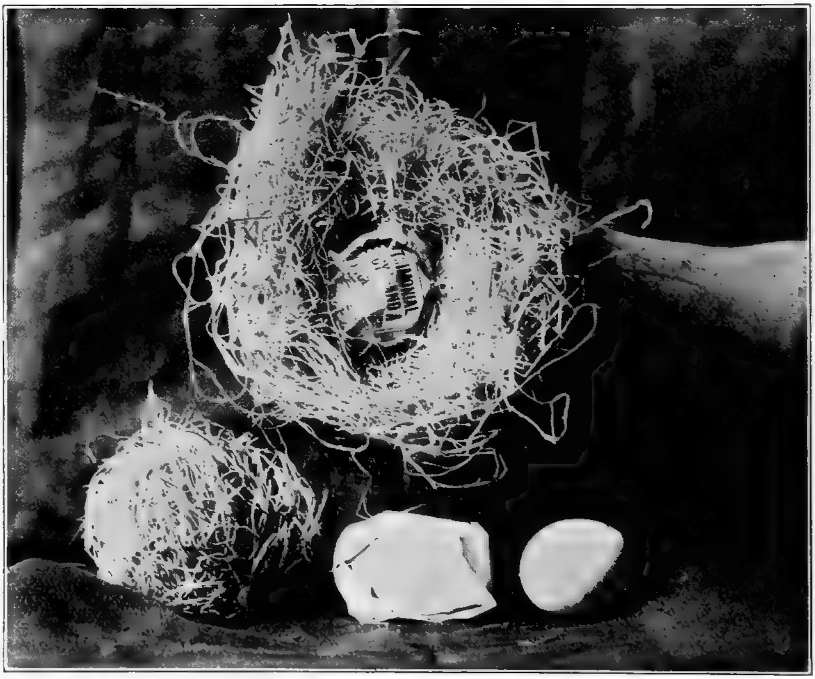
Shows the eggs first being wrapped in paper or newspaper before the excelsior is placed around it.

the bottom covered with a two-inch layer of excelsior. No. 4. Shows the eggs wrapped in excelsior and packed snugly in the basket. No. 5. A heavy layer of excelsior above the eggs to protect them from above. No. 6. Shows the covering of cloth which has been stretched tight over the excelsior and eggs and the edges of the cloth held in place by being tucked under the rim of the basket. The handles are raised and tied and the label pasted on the cloth and the whole package ready for safe shipment.

Having assured himself as to the hatchability of the eggs themselves the breeder's next problem is to get them to his customer in a hatchable condition. There are numerous patented carriers on the market, designed for the shipping of eggs for hatching, either by express or parcel post. While we have tested most of them, none of them have proven as satisfactory as the good old-fashioned, two-handled market basket, such as is shown in the accompanying illustrations. We have shipped eggs for hatching in these baskets into every state in the Union, both by express and parcel post, and have yet to receive our first report of a broken egg, except in cases of wreck.

## CORRECT PACKING INSURES BETTER HATCHES

The basket is cheap. It is light, yet strong enough for all practical purposes. Also, it is "springy," protecting egg from jars and shocks. The two handles which are tied together above the basket



Shows the egg and paper being enclosed in ball of excelsior until the whole thing is as large or larger than your fist.

after the eggs are packed, not only assist the express and mail men to "handle with care," but also prevents them from setting anything down on top of the eggs and thus transforming them into an omelet condition.

## PLACING A COVER ON THE BASKET

We use a cheap grade of muslin for the cloth to go over the basket for hatching eggs. These market baskets will hold from one sitting to fifty eggs. After they are filled and a heavy layer of excelsior is put over the top, we then cut a piece of muslin so that it is larger than the basket and extends about two inches over on all sides. We then cut a place for it to fit down around the handles. We next take an ordinary case knife and tuck the rough edges of the cloth up under the rim of the basket, as you can see in this picture. This is done all the way around and it makes a neat package. We have shipped eggs from one coast to the other packed in this way, and we have had practically no broken eggs and good hatches. We would not use or recommend egg boxes. The express men handle them very roughly and you will have many more broken eggs. If you will learn to use the baskets, as illustrated above, you will be more than pleased with the results, and so will your customers.

The method of packing the eggs is as follows: First, a layer of excelsior about an inch thick is placed in the bottom of the basket. Each egg is first wrapped in a piece of newspaper, and then in excel-

The eggs are packed snugly in the basket, as you can see. This places paper and excelsior between every egg so that it is almost impossible to break or injure them if they are handled at all carefully.

sior. The excelsior is put around the eggs with a rotary motion of the hands in making it the center of a ball about the size of an orange. These balls of excelsior are packed firmly against each other. More excelsior is then worked around them. Another layer of excelsior about an inch thick is placed over the top of them, and another layer of eggs put in. When the required number of eggs are in the basket, it is filled rounding full of excelsior, as shown in the illustration, and a piece of cambric, or other firm cloth, stretched tightly over it, the edges of the cloth being tucked under the rim of the basket with an ordinary case knife. No sewing is required.

Some breeders and large poultry farms often sell hatching eggs in lots of five hundred or more. When orders as large as this are obtained, we usually follow the same method of packing the eggs as that already described, excepting that we use stout, well preserved sugar barrels and pack five hundred eggs in each barrel. The cover is then placed on the barrel top in the same manner as that used when packing eggs in bushel baskets.

## PRACTICAL LESSONS TO APPLY

1. Aim to give the other fellow his money's worth—and more—in every deal. Found your business on a fair-play, Golden Rule policy—"Do unto others as you would have them do unto you." Think if you would like to pay what the other fellow is paying for every bird you ship out. Bear in mind the results the other fellow will get on the eggs you ship him or the day-old chicks. Ask yourself the question, honestly and fairly, "Is he getting his money's worth?" Answer it in every shipment, with quality that will allow you to conscientiously say—"Yes."

2. Study and know every bird you sell and that you raise. This means to be with your flock early and late. Give each bird thought and care. This is possible even though you handle them by the thousands. It is the sure secret of success in Standard bred poultry selling. Know every bird on your place—a big job, maybe, but one worth while.

3. Study, clip and keep in your files the catalogs, advertisements, plans and methods of others who are selling Standard bred poultry. Do this, not only with those in the same line you are, but in other similar lines. Study the ads, catalogs, methods, etc., of people selling food products, automobile tires—in fact, everything—and watch for successful ideas that you can adapt to your own business.

4. While watching other developments, other catalogs and other ideas be your own individual self. Put in original thoughts and original methods. Do not be a copyist. Although it is legitimate to take catalogs, ads and methods from another line and adapt them to your own, it is far better to be your own individual self and apply your own ideas and methods, being sure that they come in good business rules.

5. And it all may be summed up by saying—"Use good common sense."

## QUESTIONS ON BUILDING UP A TRADE IN STANDARD-BRED POULTRY

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1. Why is it best for the commercial egg farmer to specialize in pure-bred poultry?

2. Why is it especially true that it is best to pursue a policy of honesty in building up a trade in poultry?

3. What does the location of a poultryman's farm, with respect to railroads and good markets, have to do with his success or failure?

4. Why is it advisable to breed for eggs as well as for fancy?

5. What can you say of the possibilities of judicious advertising?

6. Why does it usually pay poultrymen to do their most extensive advertising in poultry journals?

7. Name the five essential parts of a good display advertisement.

8. Why is it advisable to "key" all advertisements if you are advertising with more than one paper?

9. When you have received an inquiry, what are some of the things it is advisable to have and to do to help you land the sale? (Notice to student.—Please study the letters carefully, both inquiries and replies. They will aid you in establishing a profitable business).

10. Is it advisable to exhibit at a number of shows each season, or is it best to exhibit at one or two good shows and endeavor to make a better winning at each?

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